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This teacher's manual is one of a series of instructional aids prepared by the Department of Agricultural Education at the Pennsylvania State University. It includes suggestions and references for the teacher to use with the student manual available as VT 007 369. In addition to the subject matter in the student manual, pages are inserted at the end of each problem area containing suggestions, references, resource people, audiovisual aids, suggested learning activities, suggested placement experiences, and a quiz. A unit examination is available at the end of the document. (DM)

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The Pennsylvania State University
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This publication was prepared and edited by the following staff members of the Department of Agricultural Education, College of Agriculture, The Pennsylvania State University: N. Laurence Miller, Graduate Assistant, William J. Brown, Jr., Instructor, R. Jack Mercer, Instructor, Gene M. Love, Associate Professor, and Richard F. Stinson, Associate Professor.

Technical assistance was received from the following staff members of the Department of Landscape Architecture, College of Arts and Architecture, The Pennsylvania State University: Wayne H. Wilson, Professor and Head and James P. DeTuerk, Assistant Professor.

Illustrations, photographs, and an accompanying series of color slides were largely the work of Richard W. Tenney, Graduate Assistant, Department of Agricultural Education.

In cooperation with
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Introductory Statement

Landscape Maintenance and Establishment - A Teacher's Manual is one of a series of instructional aids being prepared and edited by the Department of Agricultural Education through a contractual agreement between The Pennsylvania State University and the United States Office of Education, Division of Adult and Vocational Research. In addition to the development of instruction aids, the contract provides for two teachers' institutes in ornamental horticulture. The first was held July 5-22, 1966. The second was held July 3-21, 1967.

Teachers from the northeastern states who participated in the teachers' institutes field-tested, evaluated, and helped improve the organization and the content of the unit of instruction.

A special advisory committee has provided guidance in the selection of areas of emphasis for which several units of instruction in ornamental horticulture have been prepared. The committee has assisted by outlining key problem areas and by suggesting important subject matter information to be included in the content of each unit. In addition to Wayne H. Wilson and James R. DeTuerk, who have been cited previously, the following persons have served in an advisory capacity for the development of this unit of instruction: Darrell E. Walker, Professor and Head, Robert P. Meahl, Professor, and Craig Oliver, Assistant Professor, Department of Horticulture, The Pennsylvania State University.

Richard F. Stinson, Project Director
David R. McClay, Associate Project Director
Glenn Z. Stevens, Associate Project Director

Note to the Teacher

This Teacher's Manual includes suggestions and references for the teacher incorporated with the student handbook. The suggestions and references for the teacher have been printed on the green pages following each problem area.

In preparing to teach a problem area the teacher may wish to use this manual as follows:

1. Read the student material pertaining to the problem area.
2. Obtain and read the recommended references.
3. Order visual aids.
4. Read the suggested student learning activities and make plans for using those which seem appropriate.
5. Read the key questions to be emphasized shortly before teaching the unit.

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PROBLEM AREA 1

OCCUPATIONAL OPPORTUNITIES IN LANDSCAPE HORTICULTURE

Objectives

The major objective of this problem area is to explore the occupational opportunities in landscape horticulture. Students should learn about the:

1. Kinds of occupations in landscape horticulture and the competencies needed to perform the duties of each occupation.
2. Types and level of education needed to attain the competencies required for successful performance in an occupation.

Key Questions

1. What occupational opportunities exist in landscape horticulture and what is required to enter these occupations?
2. What educational opportunities are available for securing the competencies needed for the various occupations?
3. What opportunities exist for work experience in the various occupations?

New Words

Landscape (noun) - a stretch of inland natural scenery as seen from a single point

Landscape (verb) - to improve or change the features or appearance of a park, lawn, garden, etc.

Landscape architect - one whose profession is to plan the decorative arrangement of outdoor features, especially at or around building sites

Ornamental horticulture - those subject areas of horticulture which have to do with the production and use of plants grown for use as ornaments

Shrub - a woody perennial (plants which endure for the year or longer), plant of low stature, characterized by persistent stems and branches springing from the base

Shrubbery - shrubs collectively

OCCUPATIONAL OPPORTUNITIES IN LANDSCAPE HORTICULTURE

More well trained people are needed who can provide landscape design, establishment, and maintenance services. Nurseries and landscape designers sell over 300 million dollars of plant materials and services each year. They employ thousands of people. By all indications, these phases of agriculture will continue to increase in importance. Most of the occupations in these areas should appeal to people who enjoy working outdoors, meeting people, and working with plants. The following occupations require different levels of competence in landscape establishment and landscape maintenance.

A student interested in horticulture and landscape design has several means of preparing for entry and advancement in horticultural occupations. This course in landscape maintenance and establishment is intended to acquaint you with the kinds of jobs in this field and to help you to develop certain skills needed by those working in it. Work experience will also provide opportunities for learning and later advancement.

Home study after completion of this course is a practical means for increasing efficiency and capability in this field. The Pennsylvania State University offers correspondence courses and short courses, varying from several days to several months in length, for those who wish to continue advancing in this field.* A number of post-high school technical schools and junior colleges offer 2-year programs in this field. A student interested in professional positions should prepare to enter a 4-year college program leading to a bachelor's degree. Some college graduates earn more advanced degrees so they can move more rapidly into management, teaching, extension, or research positions.

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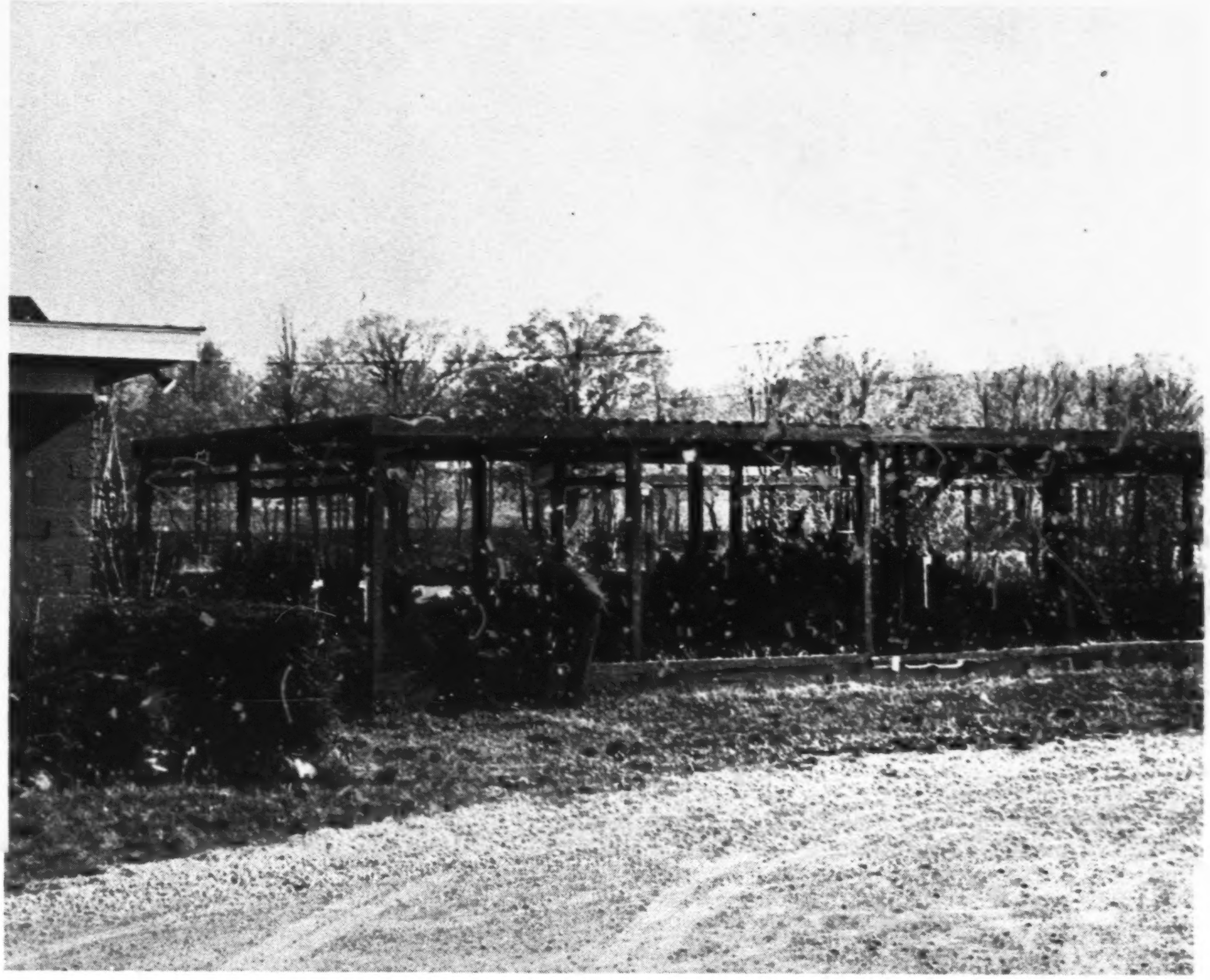
*Correspondence Courses in Agriculture and Home Economics, The Pennsylvania State University, University Park, Pennsylvania 16802.

Course 131.	Landscape Planning for Small Properties
Course 135.	Trees
Course 137.	Shrubs
Course 140.	Vines



Landscape Nurseryman

The landscape nurseryman designs, establishes, and maintains small scale landscaping projects. He may also establish and landscape from plans developed by a landscape architect. Many landscape nurserymen operate nursery or garden centers. The landscape nurseryman must have extensive knowledge of plant materials and their uses. He needs to understand landscape design, construction, and business principles. Entry into the profession is through technical training and practical experience. A college education may be beneficial, but it is not essential.

More details are given in Careers as Landscape Architect and Landscape Nurseryman, Reference No. 6, and The Nursery Business, Reference No. 30.

Garden Center Manager

The garden center manager is responsible for the successful operation of a retail garden center. He oversees the sales personnel, maintains proper inventory levels, introduces new sales items, and is responsible for the management of the business. He must have a thorough knowledge of plant materials, garden equipment and supplies, and must be able to advise customers on their uses. A high school education stressing horticultural and business courses is very desirable. Experience in the field is also a requirement. Education in ornamental horticulture and business is recommended. A college education would be helpful. For more details, see Operating a Garden Center, Reference No. 22.

Grounds Superintendent

A grounds superintendent maintains the grounds of industrial, commercial, public, and private properties. His duties include the supervision of maintenance practices such as pruning, clipping, mowing, weed control, fertilization, insect and disease control, structure repair, and other duties. An extensive knowledge of plant and landscape maintenance practices is desirable. Persons desiring to enter this occupation should develop a basic understanding of landscape design, establishment, and maintenance in high school. Additional technical training and work experience is usually required.

For more details, see Handbook of Agricultural Occupations, Reference No. 17, pp. 199-212.

Park Foreman

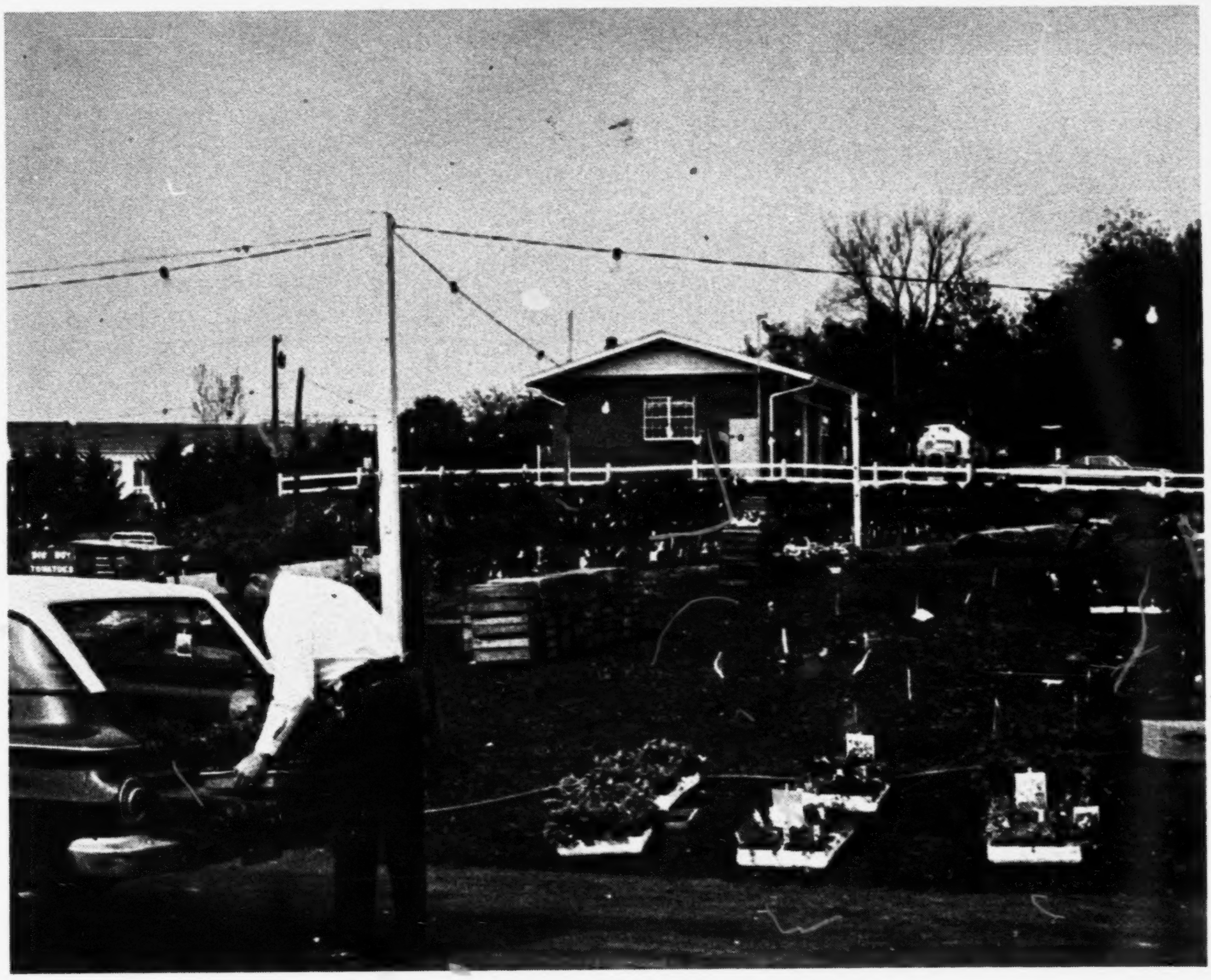
The park foreman supervises activities of workers engaged in the maintenance and establishment of nursery plantings, flower beds, walks, drives and park equipment. Mowing, weeding, road repair, trash disposal, pruning, planting of formal gardens, and insect control are typical work activities which he supervises. A sound knowledge of landscape establishment and maintenance, mechanics, and the ability to meet and work with people are essential. A high school education including courses in horticulture and on-the-job training is necessary for success in the position. Technical training in horticulture is also desirable.

For further details, see Handbook of Agricultural Occupations, Reference No. 17, pp. 199-212.

Nursery Salesman

The nursery salesman works at the wholesale or retail level. On the retail level, he sells trees, shrubs, and ground covers at the nursery and provides some landscaping services. A knowledge of plant uses and characteristics is essential and may be learned both on-the-job and in nursery and landscaping courses taught in high school. Post-high school technical education is beneficial.

The wholesale nursery salesman sells nursery stock and nursery supplies to retail outlets, landscapers, and other nurseries. Aside from a familiarity with characteristics and uses of the plants he sells, the wholesale nurseryman must be willing to travel and have an understanding of salesmanship and business practices. High school training in ornamental horticulture and business and post-high school technical training are necessary for entry and advancement in this occupation. Read further in The Nursery Business, Reference No. 30.



Garden Center Salesman

The garden center salesman performs a variety of duties. He sells plants and garden supplies, acts as a home grounds consultant for do-it-yourself landscapers, offers suggestions for care and use of materials purchased, and cares for plants and supplies being merchandised. Qualifications for the occupation include a knowledge of plant and garden materials, the fundamental principles of salesmanship, some knowledge of business principles, and an interest in meeting people. The necessary preparation to enter the field can be developed through high school courses in the above areas and work as a part-time employee in the trade.

For further reading, see Operating a Garden Center, Reference No. 22.

Lawn & Garden Center
PEAT MOSS

Garden Center Worker

A service worker in a garden center cares for garden supplies and nursery stock. He loads, unloads, and stores supplies, waters plant materials, and frequently aids in selling nursery stock and garden supplies. A high school education which includes courses in nursery and landscaping is desirable. Job entry may be gained through part-time work experience or through on-the-job training. Employment may be seasonal.

For additional information, see Operating a Garden Center, Reference No. 22.

Landscape Worker

A landscape worker usually works under the supervision of a foreman in establishing and maintaining landscapes. Some of his duties include planting shrubbery, mowing and weeding turf areas, pruning shrubs, spraying to control weeds, insects, and diseases, and other landscape maintenance practices. A high school education with emphasis on landscape establishment and maintenance courses is helpful, but not essential. On-the-job training is an important means of entering the occupation. Employment is seasonal.

For further information, read Handbook of Agricultural Occupations, Reference No. 17, p. 206.

Suggestions and References for the Teacher

There are many occupational opportunities in landscape design, establishment, and maintenance. A survey of vocational-technical manpower needs indicated that about 77.4 percent of the job opportunities are for service workers. The median entry wage for the service workers surveyed was $3,765 per year. Higher wages may be expected for employees with technical, supervisory, and managerial competencies. Students should be encouraged to explore the characteristics of different jobs in landscape horticulture and to determine ways of attaining the competencies necessary for entry and advancement in an occupation.

Each student should be able to identify the skills and rewards associated with each occupation. Students should develop an awareness of opportunities for on-the-job training and for technical education. Students planning to enter professional fields should take the courses in high school which are necessary for college entrance.

Learning Resources

References:

Careers as Landscape Architect and Landscape Nurseryman, Reference No. 6.

Handbook of Agricultural Occupations, Reference No. 17, pp. 187-212.

Operating a Garden Center, Reference No. 22.

The Nursery Business, Reference No. 30.

Resource People:

Landscape Architect; Nursery Owner, Foreman, or Worker; Agricultural Extension Agent or Specialist; and Garden Center Manager or Salesman.

Audio Visual Aids:

"A New Broom Sweeps Green," film, California Association of Nurserymen, 304 Mitau Building, 8th and J. Streets, Sacramento, California, 95814.

Suggested Learning Activities

1. List the classifications of occupations in ornamental horticulture on the blackboard. Fill in the: (1) percentages of occupations in each occupational category, (2) the median salaries at entry and advancement levels. The data for Pennsylvania was secured from Off-Farm Agricultural Occupations in Pennsylvania published by the Department

of Agricultural Education, The Pennsylvania State University. Similar data can be obtained from Agricultural Education Departments in many other states. The following is a suggested blackboard layout for presentation of the information.

Characteristics of Occupations in Ornamental Horticulture

Level of Employment	Percentage of Persons Employed	Median Entry Salary	Median Highest Salary
Professional	1%	$6,666	$9,187
Managerial	13%	$5,523	$8,200
Technical	2%	$3,482	$5,833
Sales	5%	$4,030	$5,031
Clerical	1%	$3,555	$5,999
Services	78%	$3,765	$7,971

With this introduction, have students read about specific occupations listed in Problem Area 1 of the student handbook or from other references which have information about agricultural occupations.

2. Furnish students with catalogs and pamphlets concerning professional and non-professional careers in ornamental horticulture or landscape horticulture. The guidance department is an excellent source of occupational information.
3. Have students develop a series of bulletin board displays depicting various occupations in landscape design and maintenance.
4. Invite a resource person to discuss occupational opportunities in ornamental horticulture. He should be encouraged to discuss the characteristics and competencies needed by an employee. Plan a question and answer session. Prepare questions in advance.
5. Ask each student to visit a business employing people in this activity. Each student should give an oral and written report of what he observed while visiting the business.

Suggested Placement Experiences

1. Ask the employer to discuss occupational opportunities and seasonal activities with students placed in his business.
2. Ask the employer to provide a series of different work experiences for students placed in his business. Working at different types of jobs allows students to become familiar with the competencies needed for entry level jobs.

Test

1. List several ways to secure vocational training in ornamental horticulture.
2. What types of interests indicate that a person may be suited for an occupation in landscape horticulture?
3. Inventory your personal likes and dislikes and determine the types of jobs in ornamental horticulture which are of most interest.

PROBLEM AREA 2

LANDSCAPE MAINTENANCE

Objectives

Landscapes require proper maintenance if they are to remain attractive. The major objective of this problem area is to make students aware of the proper maintenance practices. Students should learn to:

1. Prune shrubbery and trees properly.
2. Fertilize landscape plantings properly.
3. Mulch and water landscape plantings.
4. Control weeds, insects, and diseases.

Key Questions

1. When and how should landscape plants be pruned?
2. What fertilizer practices are followed with landscape plants?
3. Why are landscape plantings mulched?
4. How should landscape plants be watered?
5. How are weeds, insects, and diseases controlled in landscape plantings?
6. What measures can be taken to provide winter protection to landscape plants?

New Words

Annual - a plant that lives only one year or season
Available P_2O_5 - phosphorus in a form that can be used by the plant
Chlorotic leaves - leaves that have lost their color or turned yellow
Deciduous trees - trees that shed their leaves annually
Emulsion - suspension of a finely divided oily liquid in another liquid
Foliar sprays - sprays applied to the leaf surfaces
Herbicide - a selective weed killer
Leaf mold - a downy or furry growth on the leaf caused by fungi
Nutrient - a substance that promotes plant growth and development
Peat - partly decayed, moisture absorbing plant matter found in ancient bogs and swamps and used as a plant covering
Perennial - a plant having a life cycle of more than two years
Pesticide - a chemical used to destroy a pest

Succulent growth - growth having juicy tissues

Systemic - affecting the entire body system

Toxic - poisonous

LANDSCAPE MAINTENANCE

An established landscape must be properly maintained to keep it useful and attractive. Many home owners do not have time to maintain attractive landscapes and need landscape maintenance services. Providing needed landscape maintenance services helps the home owner to keep his home attractive and provides a source of income for the landscape contractor. Landscape maintenance firms are constantly looking for new and better equipment, ideas, and methods for caring for landscaped areas. Some good general references are America's Garden Book, Reference No. 2, pp. 672-682; Approved Practices in Landscaping the Home Grounds, Reference No. 4, pp. 97-123; and Sunset - Basic Gardening Illustrated, Reference No. 5, pp. 87-94.

Pruning

Ideally, one would like to grow trees and shrubs, except formal hedges, without pruning them at all. Many require very little pruning. When it becomes necessary to remove branches to improve a tree or shrub, the pruning should be done for one or more of the following reasons:

1. To remove or repair injured parts
2. To stimulate old or overgrown plants
3. To improve the shape
4. To maintain a formal shape

An excellent reference on pruning is Pruning Handbook, Reference No. 25.

Injured Plants

When broken branches and torn bark are discovered on trees and shrubs, they should be repaired at once. Broken branches should be removed just above a strong lateral branch. Torn bark can sometimes be replaced immediately. If held tightly in place with a wrapping of soft rope for several months, torn bark may heal. Open wounds greater than one inch in diameter should be painted with an asphalt emulsion paint to prevent infection.

Rejuvenation

Sometimes shrubs become so old that they are loose and open and flower poorly (lilacs, for example). Or they might become too large for the space they occupy (Taxus, for example). When this occurs they should be heavily pruned to restore their youthful appearance.

Many old deciduous shrubs are best rejuvenated simply by cutting all wood to the ground line in late March or early April. A mulch of well-rotted cow manure applied to the soil around the plants immediately after pruning will be helpful. A large number of sprouts will grow from 3 to 6 feet tall the first season. These should be thinned to leave 6 to 8 of the strongest to grow the second season. By the third season the shrubs will have filled out to the normal form. Shrubs that may be handled this way are lilac, privet, forsythia, spirea, viburnum, cotoneaster, honeysuckle, barberry, abelia, and other multiple-stemmed shrubs.

Certain overgrown narrow-leaved evergreens (Taxus, most junipers) may be "headed back" by removing a portion of long branches. The cut is made about 1/4 inch beyond a strong lateral. This is done in April so the flush of new growth in May and June will obscure the cuts.

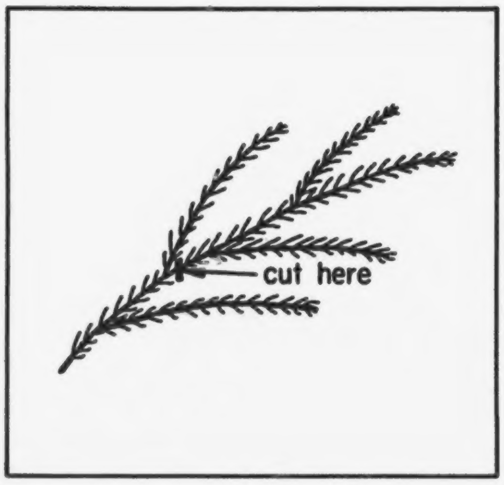


Figure 1. "Heading back"

Developing Form

Some evergreen and deciduous shrubs may develop an odd form. This can be corrected simply by "heading back" the longer shoots to develop a more balanced and compact appearance. This must be carefully done to avoid destroying the natural form of the plant. Sometimes only two or three branches need to be pruned. This is really corrective pruning and may be done with any plant requiring it, except rhododendrons. Rhododendrons do not readily develop new shoots on old wood.

To avoid removing flower buds, this pruning is done in early spring only to summer-flowering shrubs (abelia, vitex, butterfly bush, and holly).

It is done in June, after flowering, for the spring-blooming shrubs (forsythia, lilac, weigelia, flowering almond, flowering quince, mountain laurel, and azaleas).

Sprouts that develop below a graft union on grafted plants, such as dwarf fruit trees, are called "suckers". They should be cut off at the point where they started to grow. If not cut off, they may soon outgrow the scion and give a less desirable plant.

Pines, particularly Mugo Pine, may be maintained in more compact form by cutting off the upper half of each "candle" as the new growth occurs in the spring. These shoots may fail to develop new buds if this pruning is done after the "candles" grow into fully grown shoots. The timing of this pruning is critical.

Garden roses are pruned in early April. Removal of dead and weak shoots is done first. Then, the remaining canes are cut to leave about 12 inches of growth. "Climbing" roses are pruned only after flowering and only 2-year old wood is removed. All stubs should be painted with a tree paint.

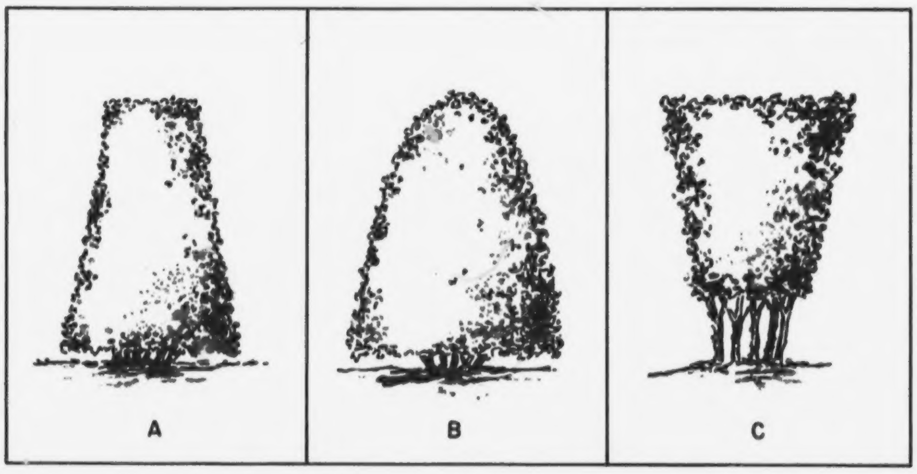


Figure 2. Properly pruned hedges are narrow at the top. Plants "A" and "B" are pruned properly. "C" has an open base due to shading of the bottom by the top.

Maintaining Formal Hedges

Hedges are sheared to maintain a formal shape. Shearing also encourages thick and compact growth. Evergreen hedges are sheared once a year in late April. Most deciduous hedges are sheared several times a season. Some fast-growing hedges (privet, barberry, multiflora rose) may require shearing every two weeks. Wooden frames and string are often used as guides during the shearing. All hedges should be shaped so that the base is wider than the top. If this is not done, the lower branches will be shaded out and the result is a "leggy" hedge. Avoid deep cuts into old wood. Once the hedge has been formed, deep cuts look unsightly and may be very slow to fill in, particularly in evergreen hedges.

Specimen plants are sometimes sheared to form animals or other figures; this is called "topiary work". It requires great skill.

Pruning Shade Trees

Shade trees are pruned in late winter or early spring, when the trees are not in leaf. This enables one to easily see the structure of the tree. Branches that interfere with pedestrians or vehicles should be removed. Shade tree crowns may be thinned to allow more light to reach inner branches. Thinning also provides increased light for grass or plants growing under the tree.

Several types of growth on shade trees are undesirable and should be removed. Water sprouts, rubbing branches, broken limbs, a secondary leader and suckers should be removed. Water sprouts are succulent, single-stemmed branches growing off a main limb of the tree. They are pruned smooth with the limb. Rubbing branches damage the bark of both limbs and may provide conditions allowing disease or insect infestation. The less desirable limb should be removed. Because it competes with the true leader, a secondary leader does not provide the habit of growth desired for the tree. It should be pruned flush with the trunk. Removal of the secondary leaders is done only with small trees to establish a single leader tree. Secondary leaders are very seldomly removed from mature trees. Working high in trees is dangerous and should be left to qualified arborists who have the proper equipment and are insured.

Avoid tearing the tree bark when pruning large branches. The following procedure for cutting off a limb is illustrated in Figure 3. First, under-cut the branch several inches from the stump. Next, remove the branch by cutting on the upper side of the branch and beyond the first cut. After the branch falls, remove the stub with a third cut. All stubs should be removed flush with the trunk or adjoining branch for best healing of the pruning cut.

All cuts, wounds, and decayed areas over one inch in diameter should be cleaned and painted with tree paint. This prevents decay from entering the tree while the wound heals.

Fertilizing Landscape Plants

Trees, shrubs, vines, and ground covers can be fertilized in the spring and fall with a "complete" fertilizer. A complete fertilizer contains at least three major elements--nitrogen (N), phosphorus (P), and potassium (K). The percentage of each of these elements in the fertilizer is usually noted in large numbers on the fertilizer bag. The phosphorus is listed as available P_2O_5 and the potassium as available K_2O. These numbers represent the fertilizer grade. One of the fertilizing analyses used on broad-leaved evergreens is 10-6-4. This particular grade of fertilizer contains 10 percent nitrogen, 6 percent phosphorus, and 4 percent potassium.

A soil test is often helpful in determining the need for fertilizer. Care must be taken to select samples of soil from the entire root growing area.

Applying the correct amount and analysis of fertilizer is very important in maintaining proper plant growth. If the plant is over-fertilized, lush and weak growth occurs. This type of growth is more susceptible to damage from wind, low temperatures, and disease. Under-fertilization reduces the growth of the plant, increases susceptibility to pests, and may affect appearance.

Severe plant injury may result from applications of fertilizer to very dry soil or to wet foliage. All foliage of trees, shrubs, turf, and other plants should be washed with water within 30 minutes following application of fertilizer.

Occasionally visual symptoms of fertilizer deficiency will be noticed. These "hunger" signs include undersized leaves, yellow or chlorotic leaves,

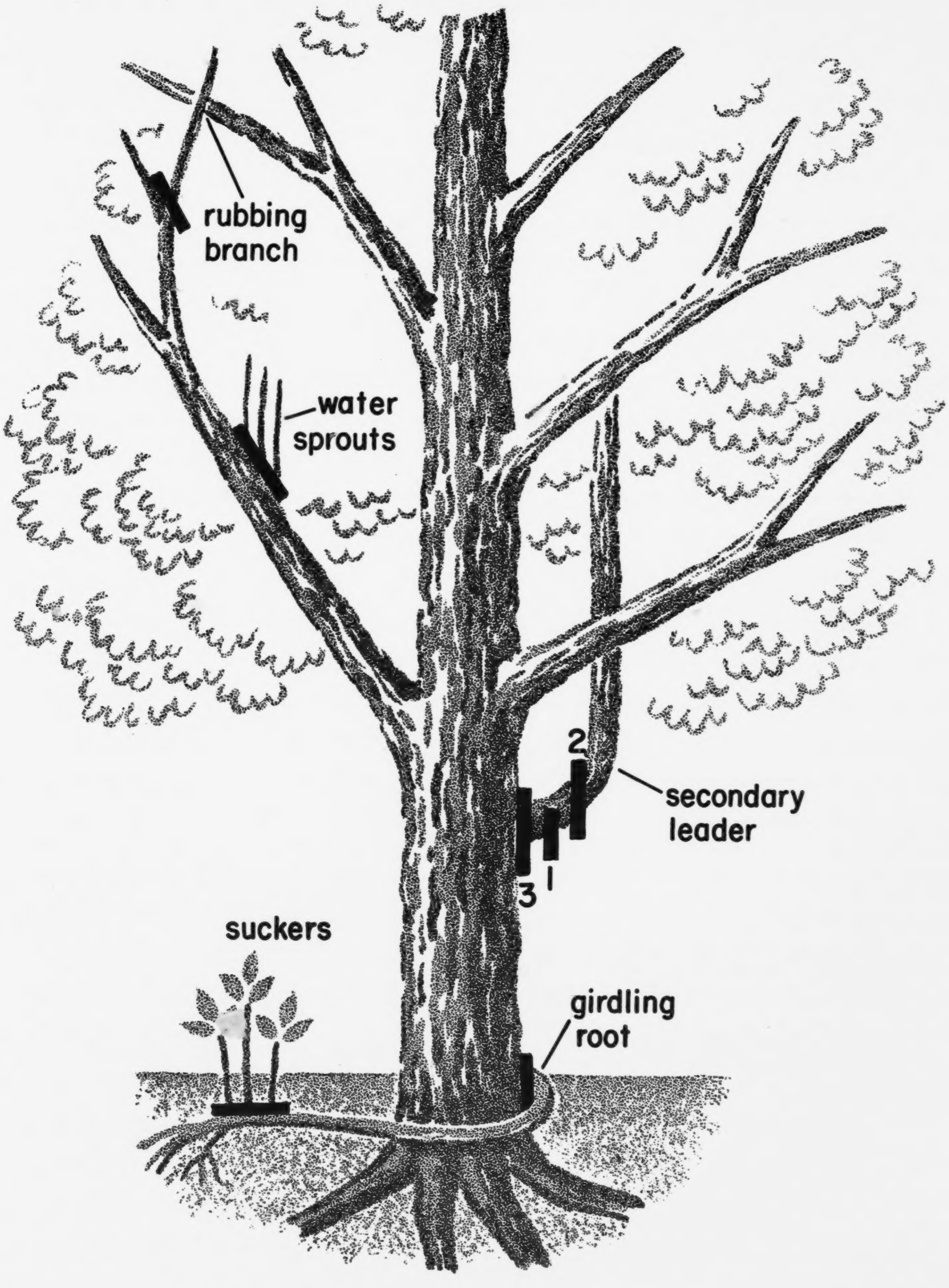

rubbing branch
water sprouts
2
secondary leader
3
1
suckers
girdling root

Figure 3. Pruning Shade Trees.

sparse foliage, and less than normal twig growth. Be aware that some of these symptoms may be caused by insects, plant diseases, or poor soil structure. If there is no evidence of pest damage and the soil structure is good, the problem is probably due to low fertility or the lack of a particular nutrient.

Fertilizing Trees, Shrubs, Ground Covers, Vines, and Lawns

Trees usually receive adequate fertilizer from that applied to lawns, shrubs, or ground covers surrounding them. Shrubs are usually fertilized every two or three years. These applications of fertilizer may be made from early spring until early summer and from the beginning of dormancy (mid-October) until the soil temperature drops to 45°F. (usually mid-November). If fertilizer is applied in the fall, it has more time to penetrate the soil and become available to the plant through its roots. When spring comes, the shrub will contain a supply of nutrients for growth. Late summer applications of fertilizer stimulate succulent growth which is often killed during the winter.

A complete fertilizer with a 10-5-5 analysis is recommended for shrubs which are grown for their foliage. Flowering shrubs are an exception. Fertilizer for flowering shrubs should contain less nitrogen. A 5-10-5 analysis fertilizer is usually recommended. Using fertilizer which includes nitrogen, phosphorus, and potash is necessary unless the soil test indicates that one or more of the elements is not needed.

Fertilizers may be applied as liquid solutions sprayed on the ground or as dry material worked into the soil. The effects of liquid fertilizers appear sooner, but the effects of dry fertilizers last longer. Very diluted liquid fertilizers are sometimes used as foliar sprays for roses. The relative effectiveness of liquid fertilizer for other plants is not completely known.

Trees are fertilized only if the shoot growth rate of an established plant is less that 8 to 12 inches per season. Deciduous trees require more fertilizer than narrow-leaved evergreens. When a fertilization range is recommended, always fertilize the deciduous tree with the larger amount. The diameter of a tree 4 feet above the ground is a good indication of its size and is used in recommending rates of fertilizer. For trees with a diameter over 3 inches, apply 4 to 5 pounds of fertilizer per inch in diameter. For trees with a diameter under 3 inches, apply 2 to 3 pounds of fertilizer per inch in diameter. The lesser amount is for narrow-leaved evergreens and the larger amount is for deciduous trees.

Specimen shrubs are fertilized by the "punch bar" method except when they are planted in a cultivated border. In the latter case, fertilizer applications may be evenly broadcast on the soil surface beneath the shrubs and lightly worked into the soil. The broadcast method should be used only where the "punch bar" or injector methods are impractical.

Individual specimen shrubs may be fertilized at the rate of 1/4 to 1/2 pound per plant, depending on the size of the plant. Mass plantings of shrubs should be fertilized at the rate of 2½ to 5 pounds per 1000 sq.ft.

To apply fertilizer around a tree, punch a series of holes 2 feet beyond an imaginary line around the "dripline" (branch tips) of the tree. These holes should be 2 inches in diameter, 12 to 18 inches deep, and about 2 feet apart. Punch additional holes this size at 2 foot spacing around the tree to within 2 feet of the trunk of the tree. This procedure is called the "punch bar" method of fertilization (see Figure 4).

The recommended rate of fertilizer for the tree should be equally distributed among all the holes. Use a funnel to avoid spilling the fertilizer on the turf. After applying the fertilizer, the holes may be filled with sand or a mixture of sand and peat. If the ground is very dry, water the entire area fertilized.

Water-soluble or liquid fertilizers may be applied to trees and shrubs by inserting a fertilizer injector into the soil at the intervals and depth described in the "punch bar" method. The fertilizer is applied under pressure. This method is easier than punching holes and using a dry fertilizer. The water is used to carry the fertilizer into the soil and will help distribute the fertilizer.

If the soil pH is too high for acid-loving plants, they may develop chlorosis. This is caused by an iron deficiency and is indicated by yellow leaves with green veins. High soil pH cause iron to be unavailable by lowering the pH. It takes at least 4 to 6 weeks to correct the pH. The iron deficiency may be temporarily corrected by spraying the foliage with either one ounce of ferrous sulphate per gallon of water or one ounce of iron chelate in 10 gallons of water. Apply a second application if needed in 10 to 14 days.

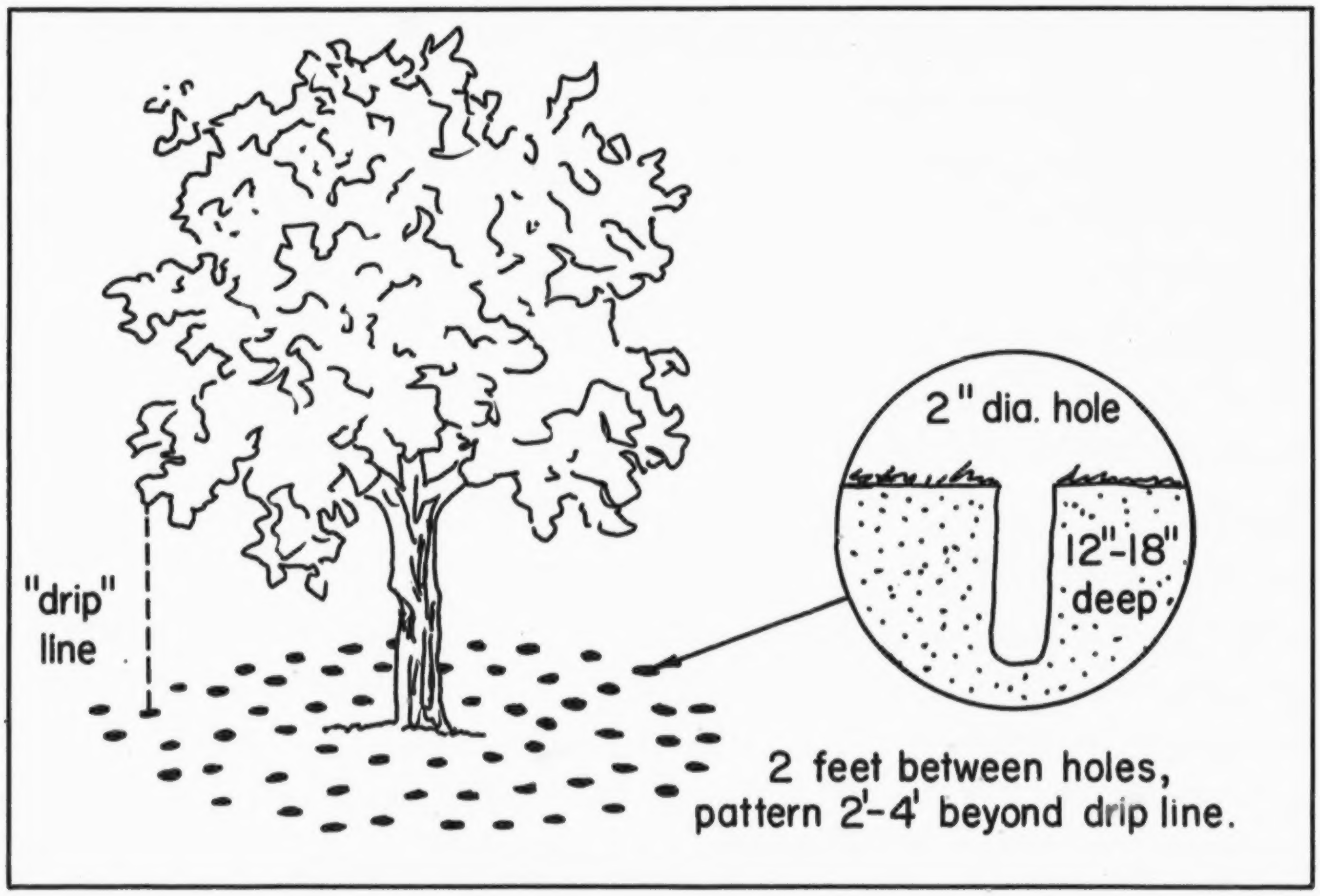


Figure 4. Punch bar method of fertilizing trees. Holes should be 2 inches wide, 12 to 18 inches deep, and spaced 24 inches apart.

Broad-leaved evergreens, such as hollies, rhododendron, mountain laurel, and Japanese andromeda require soils which are relatively high in organic matter and low in pH. The soil pH should be between 5.0 and 6.0. If a soil test shows that the pH is 6.5, the pH may be lowered by adding ground sulphur. For loam soils, 1½ pounds of ground sulphur per 100 square feet will lower the pH to 5.0. For sandy soils, the rate should be 1/2 pound. Test the soil again 4 to 6 weeks later. If the pH is still too high, apply more sulphur.

A liberal amount of peat moss or leaf mold should be added to the soil at planting time to assure a good start for the broad-leaved evergreen plants especially in heavy clay soils. A soil mixture of 50 percent peat moss is recommended.

Apply fertilizer only in the spring, and apply it sparingly. It is easy to over-fertilize broad-leaved evergreens. Over-fertilization causes more problems than if no fertilizer had been applied. Use a fertilizer which has an analysis of 5-10-5 or 6-10-4. If only nitrogen is needed, organic fertilizers such as soybean and cottonseed meal may be applied at the rate of 4 to 5 pounds per 100 square feet. Inorganic fertilizers are usually applied at the rate of 2½ pounds per 100 square feet. The fertilizer is spread thinly on top of the ground and scratched into the soil surface.

Lawns are usually fertilized 3 times a season, but recent research indicates that a mid-winter application over a thin layer of snow gives an early and long-lasting response. Urea form fertilizers are long-acting but require minimum soil temperatures of 60° for availability. Barrel-type fertilizer spreaders are very convenient to use. Severe foliage "burn" will result if fertilizer is not washed off the grass within thirty minutes.

Vines and espaliers are fertilized in the same manner as shrubs. Ground covers are fertilized by the broadcast method used for shrubs.

Table 1 on page 22 gives a quick reference to materials and rates for fertilizing landscape plants.

TABLE 1

FERTILIZER SCHEDULE FOR LANDSCAPE PLANTS

Date	Trees	Turf	Shrubs, Vines, Espaliers, and Ground Covers	Roses	Annuals	Perrenials	Hardy Bulbs	Non-Hardy Bulbs	Vegetables
April 1	fertilize in late April	fertilize	fertilize now or in October	fertilize	fertilize before planting	fertilize	fertilize when 1" high or after flowering		fertilize before planting
May 21							fertilize after flowering	fertilize before planting	side-dress with 33-0-0 when 3 - 4 inches high
June 21				fertilize	fertilize				
July 4		fertilize				fertilize			
Sept. 1		fertilize							
Late Oct. or Early Nov.	fertilize now or in late April		fertilize now or in April	fertilize					
January or February		fertilize							

NOTE: Applications should be based on soil test results. The above general recommendations are given for loam soils; heavy clay soils or sandy soils may require different materials, rates, and frequency of application.

FERTILIZER SCHEDULE FOR LANDSCAPE PLANTS

TREES:

- Analysis: 10-6-4
- No fertilizer first year. Fertilize only if new growth is less than 8-12" per year.
- Use 5# per 1-inch trunk diameter for trees 3" or over.
- 2# per inch for those under 3" in diameter.
- Put ¼ cup in 18" holes spaced at 24" intervals under branch spread. Fill holes with sand.

TURF:

- Analysis: 10-6-4; 20-10-10; or 33-0-0
- Use 15# per 1000 sq.ft. of 10-6-4 (or 7# of 20-10-10) applied evenly to dry turf.
- Water-in within 30 minutes.
- For Merion bluegrass make monthly applications.
- Use only 33-0-0 at 5# per 1000 sq.ft. alternate years. Ureaform may be substituted for this.

SHRUBS:

- Analysis: 10-5-5 (foliage types) or 5-10-10 (flowering types)
- Use 2-5# per 100 sq.ft. of area under shrub branches.

ROSES:

- Analysis: 5-10-10
- Use one handful in a ring around each plant, and scratch into the soil to prevent washing.
- To foliar fertilize in spray solution (for pest control), add one level tablespoon of potassium nitrate and one level tablespoon of ammonium nitrate to each 8 gallons of spray solution. Apply weekly from early May through October.
- If foliar fertilized, omit mid-summer fertilizer applications to soil.

ANNUALS:

- Analysis: 5-10-10 or 6-12-12
- Use 2# per 100 sq.ft. worked into soil before planting.
- Repeat and scratch into surface 4 weeks after planting.

PERENNIALS:

- Analysis: 5-10-10 or 6-12-12
- Use 2# per 100 sq.ft. Scratch into surface.

HARDY BULBS:

- Analysis: 5-10-10 or 6-12-12
- Spring Bulbs: Use 2# per 100 sq.ft. immediately after flowering.
- Lilies: Use same rate in early May.

NON-HARDY BULBS:

- Analysis: 5-10-10 or 6-12-12
- Use 2# per 100 sq.ft. before planting.

VEGETABLES:

- Analysis: 5-20-20
- Use 2# per 100 sq.ft. broadcast and worked into soil before planting.
- Side-dress when 3-4" high with 33-0-0 at 1# per 100 sq.ft.
- Scratch into soil surface.

Mulching Landscape Plants

A good mulch around garden plants serves to:

1. Conserve moisture
2. Prevent runoff, which allows more water to penetrate the soils
3. Protect the soil from drying effects of sun and wind
4. Act as an insulation to maintain more even soil temperatures

In summer, the soil under a mulch is sometimes as much as 20°F. cooler than surrounding soils. In winter a mulch prevents soil temperature fluctuations that could cause injury. A thick mulch aids in weed control. Few weeds can grow through a 2 to 4 inch mulch. An organic mulch eventually decomposes and adds humus and nitrogen to the soil. Read further about mulches in Handbook of Mulches, Reference No. 18.

When selecting materials for mulches consider: (1) the availability of the material, (2) the cost when compared with other mulching materials, (3) the appearance of the mulch, (4) the durability of the mulch, (5) the rate of decomposition, (6) the possibility of introducing weed seed, (7) the danger of introducing disease, and (8) the possibility of fire. Desirable mulches that are commonly used in ornamental plantings are peat moss, cocoa hulls, sawdust, ground corncobs, wood chips, and pine needles. Grass clippings may be used, but to avoid rapid rotting no more than 1/4 inch should be applied at any one time. The recommended depth for a fine textured mulch like peat moss is 2 to 3 inches after settling. A coarse textured mulch like cocoa hulls should be maintained at a depth of 4 inches. Mulches are usually applied during the spring or fall. Certain mulches such as sawdust and ground corncobs break down rapidly. In the process they remove nitrogen from the soil in such large quantities that they may cause the plants to turn yellow. Whenever a 2 to 3 inch layer is used, also apply ammonium sulfate at 20 lbs. per 100 sq.ft. over the top of the mulch and water it in.

Watering Landscape Plants

Newly planted trees, shrubs, vines, and ground covers need more careful watering than established trees and shrubs. During periods of dry weather, apply water at 7 to 10 day intervals. Apply at least one-inch of water if that amount has not fallen in the 7 to 10 day period. Any straightsided container placed near the plants being watered with a sprinkler may be used as a water gauge. Light waterings may do more harm than good. If trees and shrubs have adequate moisture prior to the first hard frost, there is less danger of winter injury.

When applying water to a landscaped area, use a good quality sprinkler. The sprinkler should be equipped with devices that can be adjusted to give an appropriate pattern for the area being watered. Some "creeper" types will move this water pattern over a predetermined lawn area during a period of several hours. Apply water to individual plants by removing the nozzle from the garden hose and letting a slow stream of water soak into the soil.

Weed Control

Weeds compete with desirable vegetation for light, nutrients, and water. They are unsightly, may be poisonous, and can be host to insects and diseases. Well established ground covers in shrub borders discourage weeds. Weeds in other areas may be controlled by mulching, hand removal, and by applying chemicals known as herbicides. Shallow cultivation with hand tools destroys sprouting weeds without injury to plant roots. However, the stirring of soil brings additional weed seeds to the surface where they quickly start growing. The soil must be shallowly cultivated at weekly intervals. If chemical weed control is used for lawn sprays, droplets may easily drift long distances (as much as a mile) to cause damage to tomatoes, grapes, and other highly sensitive plants. Lawn herbicides applied in dry form with a fertilizer spreader do not present this hazard. Lawn herbicides should not be applied to a young lawn (under 6 months old). For best results, applications should be made in late April and early October.

Insect and Disease Control

Insects and diseases are encountered in maintaining most landscapes. The general discussion on control measures should be studied before reading about identification and specific control measures in Diseases and Pests of Ornamental Plants, Reference No. 11.

Garden roses are susceptible to a large range of pests. They should be sprayed or dusted at 10-day intervals with an "All-Purpose Rose" dust or spray formulation. Spraying should be conducted from early May to early October.

Diseases may be caused by fungi, bacteria, or viruses. Insects can damage the plant by chewing, sucking, or mining into the leaves; this will result in galls. Insects also cause damage by boring into wood and bark, and attacking roots. One must know the identity of the plant and the pest before being able to control the difficulty. The references will be helpful. Specific controls must be used for each type of insect or disease. Types of insect and disease control include:

1. Natural control - (adverse weather)
2. Mechanical - (killing insects by hand, pruning)
3. Quarantine - (restricting the spread of infested or infected plant material)
4. Biological control - (one organism killing another)
5. Chemical control - (applying toxic chemicals)

Mechanical and chemical treatments are most efficient for small properties. Biological control is commercially practiced for some insects (milky spore disease for Japanese beetles). Chemicals and dusts are the most widespread means of control. Chemicals may be applied as sprays, granules, or dusts.

Dusts are easy to apply but can be effectively applied only when the air is calm (usually at dawn and dusk). Sprays may be applied at any time except in very strong winds or during rains. Granules are placed on the soil where they dissolve and are absorbed by the roots. Systemic chemical poisons are applied as granules or liquids to the soil, or as sprays to the leaves. They are readily absorbed through the skin of people. The hazards connected with using systemics are such that they should be used only by people trained and skilled in their application.

For effective disease and insect control, pesticide treatments must be applied at the proper time and season. Follow the recommendation in pesticide manuals published by the College of Agriculture in your state and by commercial companies, (see Appendix E).

A Diagnostic Check Sheet for Unhealthy Plants has been included in the Appendix, (see Appendix D).

SAFETY CHECKLIST FOR APPLYING HERBICIDES AND PESTICIDES

1. Use herbicides and pesticides that have been recommended by the agricultural experiment station.
2. Read the entire label and follow the directions carefully.
3. Avoid spilling pesticides or herbicides on the skin and wear recommended protective clothing. Always wash spilled herbicides and pesticides from the skin immediately with plenty of soap and water. Change from contaminated clothing and wash it thoroughly before reuse.
4. Do not apply herbicides or pesticides during windy days. Take special care to eliminate drift and contamination of crops, livestock, wildlife, and water supplies. Do not apply these chemicals above the recommended rates.
5. Always mix herbicides and pesticides in well ventilated surroundings. Avoid breathing these substances.
6. Wash hands thoroughly before eating or smoking.
7. Store herbicides and pesticides in original labeled containers and out of the reach of children and pets.
8. Dispose of herbicide and pesticide containers in a way which will prevent them from becoming a hazard to children, pets, wildlife, etc.

Miscellaneous Maintenance

Herbaceous Plants

Herbaceous plants require detailed care. This subject is presented at length in America's Garden Book, Reference No. 2, pp. 305-439.

Herbaceous plants require weekly inspection for removal of faded blossoms; one can inspect for pests at the same time. Pest control materials will usually damage flowers. Therefore, preventative applications are made only when the plants are not in flower. Control applications are made only when a pest is actually presenting a problem.

All beds should be edged at monthly intervals so that a neat appearance will be maintained. Certain annuals, petunias and pansies particularly, will flower most heavily in late summer and early fall if they are cut back leaving 4 to 6-inch stems in mid-July. A fertilizer appplication at this time will be helpful. Annuals should be removed from the beds when the frost has killed them in the fall.

Perennials require 2 to 3 years to become well enough established to give maximum flowering. Clump-forming ones, such as daylily, garden phlox, and Shasta daisy will have to be lifted, divided, and reset every 3 to 5 years to give good flowering. A light straw mulch will prevent heaving the first winter following planting. Some perennials, such as gas plant, bleedingheart, butterfly weed, and evergreen candy-tuft, should be considered permanently planted. Because a number of serious insect and disease pests over-winter on old foliage, all dead vegetation should be cut from the plants and removed from the premises. This should be done in late fall.

Hardy bulbs should be fertilized immediately after flowering to encourage development of large blooms the following year. Foliage should not be removed until it begins to yellow. While it is green, it is building up the food reserves in the bulb to carry it through the summer, fall, winter and early spring. Contrary to popular notion, hardy flowering bulbs should not be lifted until they become so crowded that flowering is reduced. This is generally only once in 3 to 5 years.

Non-hardy bulbs (gladiolus, dahlias, cannas, and others) are planted in early May, fertilized in June, and lifted in the autumn after frosts have

Lawn Maintenance

Lawns should be broom-raked in early spring to remove debris that collected over the winter. Lawns require mowing whenever the growth is ½ inch higher than the mowing height (usual mowing height - 1½ inches). This may be as frequent as every 3 to 4 days in mid-spring and mid-fall, and as seldom as once a week at other times. A sharp mower is essential. A smooth-looking lawn is obtained by varying the mowing pattern. For example, one might mow: east and west one time, north and south the next, and diagonally the third time. To obtain a dense turf, the clippings should be removed. These may be used for mulching flower beds or for making compost. Edging should be done weekly. Avoid making small ditches at the edges of walks. Such ditches catch heels and can cause accidents. Rolling a lawn in spring is unnecessary and causes undesirable soil compaction.

Pools

Pools should be drained and scrubbed down in early spring. Waterlilies are planted with the crown 1½ inches above the soil surface in loam soil. They should be planted in a container with a capacity of 2 cubic feet. A one-inch layer of sand is placed on top of the soil to prevent the water from becoming muddy. Waterlily containers should be spaced at least 6 feet apart in pools. Goldfish are added to the pool to keep down mosquitos; they need not be fed. The most satisfactory control for algae (green slime) is to drain and scrub down the pool once a month. Fish will have to be held temporarily elsewhere. Incidentally, a sudden change in water temperature is fatal to fish. Waterlilies must be covered with wet burlap to keep them from drying during this job.

Pools are best wintered with the water in them. Several pieces of logs should be added to absorb the pressure of expanding ice. Despite precautions, a few cracks are likely to develop in a concrete pool. These may be sealed with a black asphalt emulsion (other materials are highly toxic to plants and fish) applied in the spring after the pool is cleaned. The material must be allowed to dry thoroughly before the pool is filled.

Winterizing

The causes of winter injury are:

1. Drying injury due to lack of water
2. Temperature-stress injury
3. Root tearing due to frost heaving
4. Young plants
5. Inappropriate plants (wrong hardiness zone)
6. Weight injury of ice and snow
7. Soft growth
8. Compaction of grass by snowdrifts

Drying ("burning") of evergreen leaves during winter is prevented by thoroughly watering these shrubs just before freezing weather. Watering should be repeated whenever a mid-winter thaw occurs. The addition of a mulch keeps the soil from freezing deeply. Since only roots in unfrozen ground absorb much water, the mulch helps keep water available to the plant. This is particularly helpful with small evergreens with a limited root system. Mulches also reduce frost heaving of the soil with its resulting root injury.

Sudden drops in temperature may cause "burning" which is not evident until early spring. This is a particular problem with young evergreens and some broad-leaved evergreens regardless of age. Frames with burlap screens shield the plants from south and west mid-winter sunlight. The frames should be about 12 inches taller than the plants. All evergreens should be protected in this manner during the first winter or two after transplanting.

Plants from the wrong hardiness zone are often badly hurt or killed by winter weather. For example, sometimes one can get by with Zone IV and possibly some Zone III plants in central Pennsylvania which is Zone V. But this is true only if they have been planted close to the north side of a building in a place protected from sweeping winds. Planting on the north side of a building provides protection from the winter sun. The soil is also warmer in such areas.

Ice and snow may break branches because of the weight. Multiple-leader, upright evergreens (certain arborvitae and junipers) may be wound spirally with soft rope to keep the branches from being spread apart. Snow may have to be carefully swept off horizontally branched trees; cold leaves are brittle. Where snow sliding from a roof is likely to damage shrubbery, temporary roofs on short legs are often used over such plants to protect them during winter months.

Soft growth on some shrubs (forsythia, for example) may be killed over winter. Only a preventative measure is effective. Avoid fertilizing such shrubs in late summer and early fall.

Garden roses are not fully hardy, and should be mounded 8 inches high with soil in mid-November. A 12-inch straw mulch (or Christmas tree boughs) is added after the soil has frozen. The mounds are removed in late March. Florist-type hydrangeas should be protected in the same manner.

Lawn grasses may be compacted by snowdrifts, leading to "snow mold", in which the grass dies in large patches. Mowing in late fall, so the grass is short, is helpful. Loosening flattened areas with a broom rake while the snowdrifts are melting is an essential preventative measure.

A Check List for Winter Landscape Maintenance has been included in the Appendix, (see Appendix B).

Suggestions and References for the Teacher

Beautiful landscapes require careful maintenance. Unless landscapes are maintained properly, the investment in a landscape designer's fee and in establishing the landscape may be wasted. Many men have made landscape maintenance of commercial and private property a profitable occupation. They often combine snow removal and other winter activities with landscape maintenance to provide year-round activity.

Learning Resources

References:

America's Garden Book, Reference No. 2, pp. 672-682.

Approved Practices in Landscaping the Home Grounds, Reference No. 4, pp. 97-123.

Sunset - Basic Gardening Illustrated, Reference No. 5, pp. 87-94.

Diseases and Pests of Ornamental Plants, Reference No. 11.

Handbook of Mulches, Reference No. 18.

Pruning Handbook, Reference No. 25.

Supplies:

1. Pruning equipment, hedge clippers, lopers, tree paint
2. Fertilizer and spreader
3. Mulching materials
4. Herbicides, fungicides, insecticides
5. Watering equipment
6. Sprayers, dusters
7. Hand garden tools, small power tools
8. Burlap and wood for winter shelter building stakes, twine
9. Power lawn mower

Suppliers:

Garden and farm supply dealers

Audio Visual Aids:

"Pruning Practices at the Brooklyn Botanic Garden," film, Women's Auxiliary of the Brooklyn Botanic Garden, 1000 Washington Avenue, Brooklyn, New York 11225. (22 minutes)

"ABC's of Pruning Landscape Trees," slide series #340, California Agricultural Experiment Service, University of California, Berkeley California 94700.

"Pruning for Garden Beauty," 21 slides and script, Vocational Agriculture, Instructional Materials Service, Room 201, 2120 Fyffe Road, Columbus, Ohio 43200. Price - $3.25.

Suggested Learning Activities

1. Students should practice maintenance practices such as pruning, fertilizing, mulching, and applying chemicals for weed, insect, and disease control. Problem Area 2 in the student handbook includes the necessary information for learning how to maintain a landscape. Students should study the problem area and practice maintenance skills such as pruning, fertilizing, etc., on the plant materials around the school.
2. It may be desirable to maintain a portion of the school grounds in order to have a land laboratory in which students can gain experience in grounds maintenance.
3. Plan to take two field trips, one in the spring and one in the fall, to observe landscape maintenance practices being practiced at selected private, commercial, or public property. Students should learn how to properly mow a lawn and maintain the equipment.

Suggested Placement Experiences

1. Encourage students to provide maintenance services for several homes in his neighborhood. The services may include pruning shrubs, fertilizing lawns, and mowing lawns.
2. If there are landscape contractors in this area, check with them to see if they need temporary help on any of their work crews.
3. Golf courses require extra maintenance from early spring through the summer and consequently provide an excellent opportunity for work experience. Contact the golf course superintendents in the area and advise them of the number of boys who will be available for placement.

Test

1. Explain why shrubs which flower in the spring should be pruned immediately after flowering.
2. What types of plants are most likely to develop iron deficiencies? How can an iron deficiency be prevented? How can it be corrected if it occurs?
3. List several advantages of mulching plant material.
4. List several practices which are used in properly pruning shrubs and trees.
5. What grade or analysis fertilizers are used for trees and shrubs? What rates are usually applied? What methods are used in applying fertilizers to trees and shrubs?
6. What precautions should be taken before using weed control chemicals on the lawn?

PROBLEM AREA 3

LANDSCAPE ESTABLISHMENT

Objectives

The major goal of this problem area is to learn how to follow a landscape plan and actually establish the plant and structural materials on the site. To establish a landscape properly, the landscaper must know how to:

1. Take a soil sample for testing, and make correct changes in the soil.
2. Grade and drain a site.
3. Construct walls, patios, walks, and other structures.
4. Transplant shrubs and trees.

Key Questions

1. What order of operations should be followed in establishing a landscape?
2. How are soils changed to improve conditions for plant growth?
3. What construction practices are used in building walls, walks, and patios?
4. What are the steps in planting nursery stock?

New Words

Aeration - refers to the amount of air in the soil

Alternative - a choice between two things

Arborist - one who works with trees and shrubs

Balled Stock - plants which have been dug so that a ball of earth remains on their roots

Candle - young shoots of pine trees in which the stem has become longer but the needle-like leaves have not yet expanded

Cane - a shoot usually from the base of a plant

Contour - the outline of the ground

Crowned - rounded; raised in the middle; made convex

Friable - easy to crumble

Girdling - cutting into the tree--perhaps cutting the cambium layer enough to stop or retard growth

Graft - a shoot (the scion) inserted into a prepared slit in a tree or plant (the understock) so as to become a living part of it

Hardpan - a layer of very hard, often clay-like matter, under soft soil

Headed Back - a shoot from which the tip has been removed to stimulate lateral growth (side growth)

Leached - drained of nutrients

Modified - changed

Pitch - the incline, slope, or angle

Rejuvenation - to give new vigor

Scion - a twig or shoot cut from a plant for grafting onto another plant

Site Grading - to level or smooth ground to give desired drainage or surface water

Structural Plan - a plan for the construction items

Succulent - full of juice, fleshy

Swale - low, sloping ground for the collection and carrying of surface water

LANDSCAPE ESTABLISHMENT

Landscape contractors are hired to put in the structural features and plant material shown in the landscape design plan. In many cases, homeowners prefer to do some of the construction work and planting themselves. In either case, proper establishment of the landscape can be done only with a detailed knowledge of the steps involved.

Starting the landscape primarily involves: (1) laying-out the landscape plan, (2) making any needed changes in the grade of the site, (3) installing drainage systems if they are needed, (4) building structures such as walks, drives, etc., (5) preparing the soil for greatest plant growth, (6) transplanting the nursery stock, and (7) seeding the lawn. A landscape contractor is always looking for new and improved construction and plant materials and new and better ways to use them.

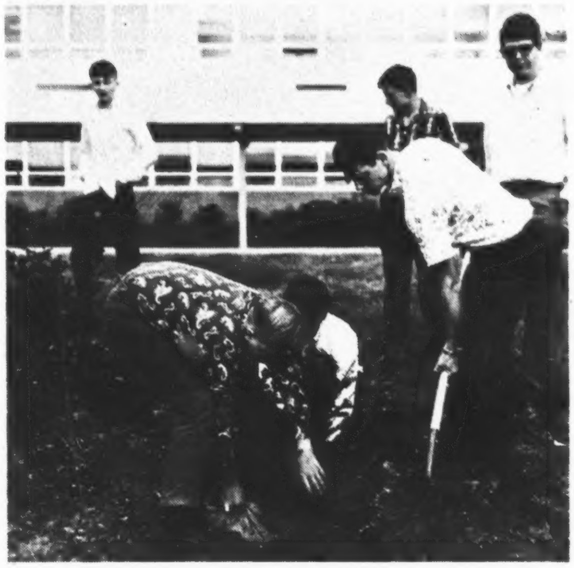
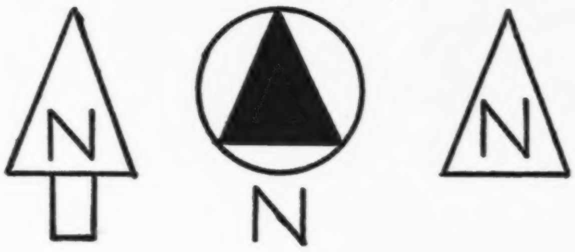


Figure 5. Workers mix peat with the soil before planting a Taxus.

Reading the Blueprint

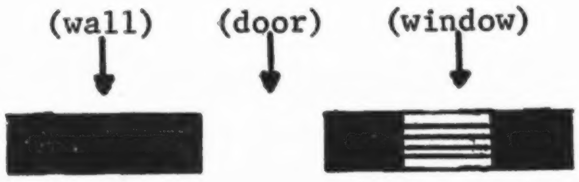
Before you can go through the steps of establishing a landscape according to a landscape plan, it is necessary to understand how to read a blueprint. Landscape plans use symbols (small pictures) and words to indicate items of information in the plan. Some examples of these are shown below. It would be a good idea to learn to recognize them and practice identifying them in landscape blueprints, such as that shown on page 38.



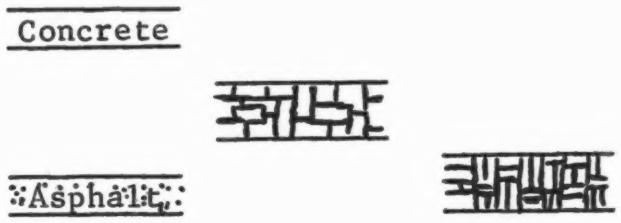
Orientation is indicated by a symbol indicating the direction of north. In most landscape designs, north is at the top of the sheet. It is a good idea always to check, however, because the lot might not be "square" with the compass direction.

Scale: 1/8" = 1' - 0"
Scale: 1" = 20' - 0"

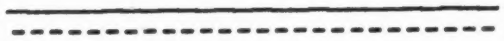
Scale indicates what a given distance on the plan would equal on the ground. A scale of 1/8" = 1' - 0" means that 1/8 inch on the plan is equal to 1 foot and no inches on the ground.



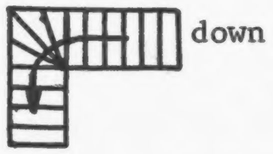
Construction symbols frequently used are: house walls shown as solid black lines, doors shown as interruptions in the black lines, and windows shown as double or triple thin lines across interruptions in the black lines.



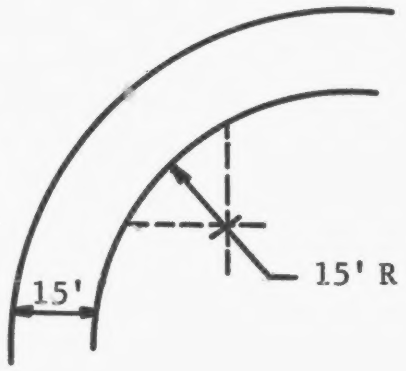
Paving is often indicated by lines with words to indicate the kind of material. Sometimes the pattern of a flag stone or brick walk is used without words.



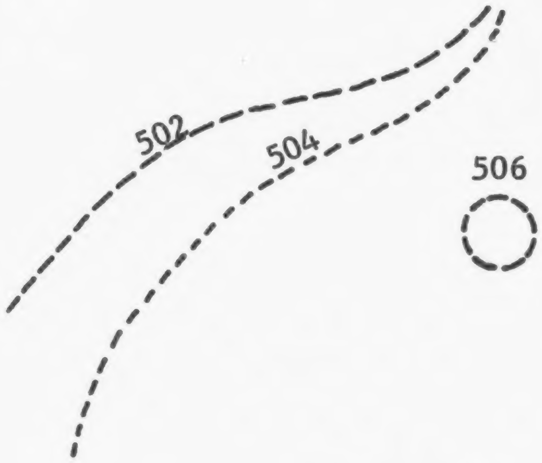
Boundaries are usually indicated by solid or interrupted lines.



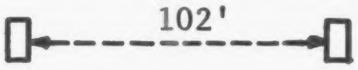
Steps are often shown by a series of lines and an arrow indicating "up" or "down" from one level to the next.



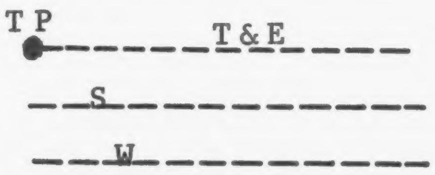
Curves in walks or driveways are usually shown with the radius of the circle they would make if the curve were made into a circle. Notice that the outside curve would have a 30 foot radius if the drive is kept at 15 feet wide through the curve.



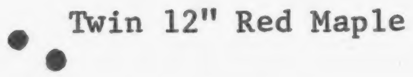
Contour lines show where the level lines representing the same height of the land are located. In our example, line 502 represents a line 502 feet above sea level. Line 504 represents 504 feet above sea level or 2 feet higher than 502. Line 506 represents a small knob 2 feet higher than 504.

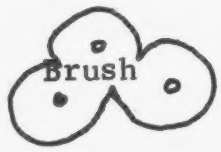


Distance is usually indicated by a dotted line with arrows and a number indicating the distance in feet. Sometimes inches are included (102' - 0").

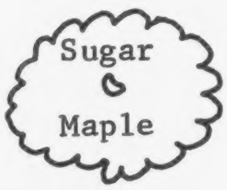


Utilities are represented by dots for telephone poles; dotted lines for wires or pipes; and letters to indicate telephone, electricity, sewer, water or gas.

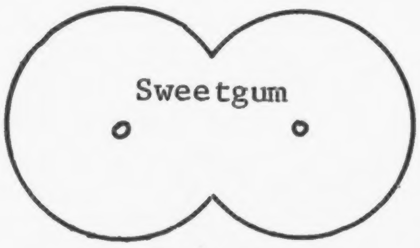




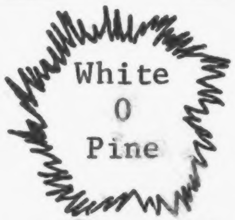
Trees and shrubs may be indicated as shown at the left. In case only the trunks are shown, you must guess at how wide the branches spread.



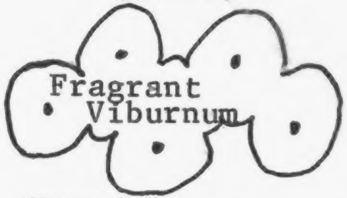
Deciduous trees are often shown with a circle representing the trunk and curves indicating the extent of the branch tips.

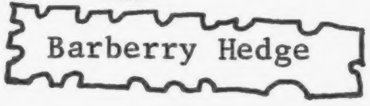


When two touching trees are the same species, the space between them may be left open to show this. See Appendix C for additional symbols.

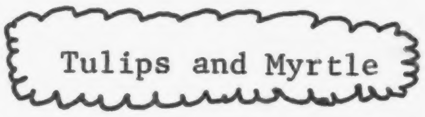

White
O
Pine

Evergreen trees are often shown by saw-tooth symbols of various kinds. Additional symbols may be seen in Appendix C.

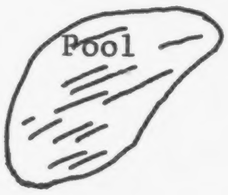

Fragrant Viburnum

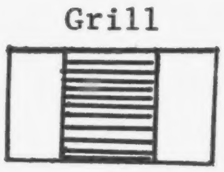

Barberry Hedge

Shrubs are often shown as dots with circular patterns indicating the space occupied. Sheared hedges may be shown by straight line enclosures.

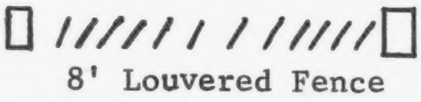

Tulips and Myrtle

Borders and flower beds may be indicated by enclosing lines and words.





Garden features, pools, grills, fences, etc., may be indicated by simple outlines and words.


8' Louvered Fence

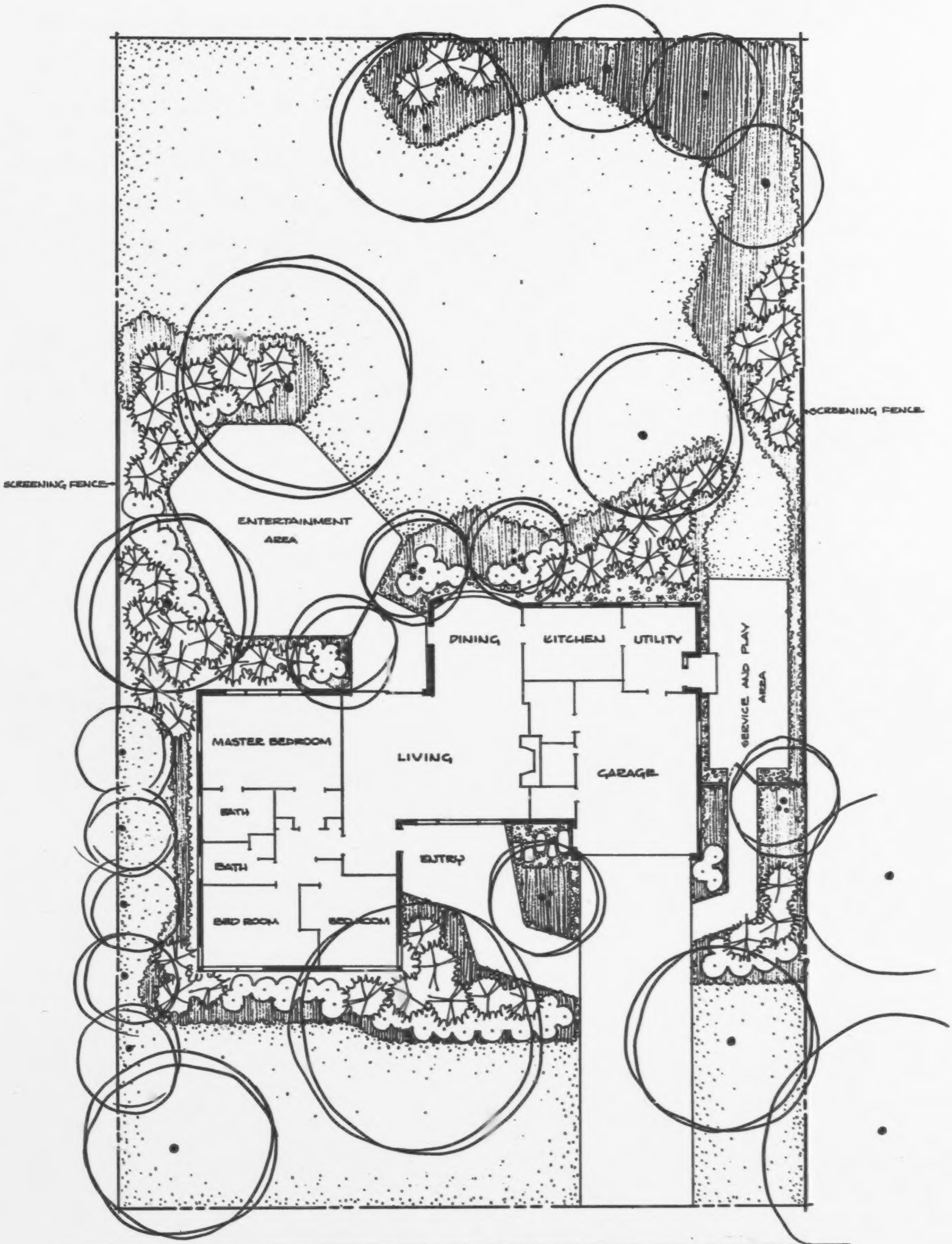

SCREENING FENCE
SCREENING FENCE
ENTERTAINMENT AREA
DINING
KITCHEN
UTILITY
SERVICE AND PLAY AREA
MASTER BEDROOM
LIVING
GARAGE
BATH
BATH
ENTRY
BED ROOM
BED ROOM

Figure 6. Landscape Plan

Laying Out the Landscape Plan

The total landscape plan should be laid out before any work begins on establishment. Grade changes are marked out with stakes. In cases of major grade changes, it is best to use the services of a person skilled in using a transit or land level. He will aid in planning cuts and fills so that no problems in soil volume will exist at the end of the grading operation.

The drives, walks, walls, and terraces should be staked out to indicate their locations and to serve as a guide for locating plant material. Plant locations are marked after the final grade is established.

A good general reference is The Art of Home Landscaping, Reference No. 29, pp. 247-256.

Grading the Site

The site is graded to change the slope and contour of the landscape. Always remove and store the topsoil before any major grading work is started. Stockpiling the topsoil preserves its structure and keeps it from being buried or mixed with subsoil in the grading operations. After the final grade is done, the topsoil can be spread over the area and prepared for planting.

Sometimes extra amounts of soil or "fill" are needed in changing the contour of the site. By prior planning, subsoil from excavations on the site can be utilized for "fill" material. In any case, the "fill" should be used and not just spread over the lot and mixed with the topsoil.

Grading should be done in such a way that the surface water will be carried away from the house in all directions. If grading is not done properly, wet basement walls and floors will result. The slope should be about 1/4 to 1/2 inch per foot. Land around a hillside house should be sloped away from the house into a broad swale carrying the surface water around the house to a lower level. The distance from the house foundation to the center of the swale should be about 20 feet. Houses constructed below street grade present a special drainage problem that is best handled by a civil engineer.

All houses need some nearly level areas, especially in the private area. If the site is sloping where a level area is desired, the slope can be terraced by "cutting and filling" as shown in Figure 6. This method cuts into high areas and uses the soil to level out an area. The bank created by the "cut" can be contained attractively by a retaining wall. Or, if the slope has a drop of 1 foot or less per 2 feet of horizontal, turf or a ground cover will usually retain it.

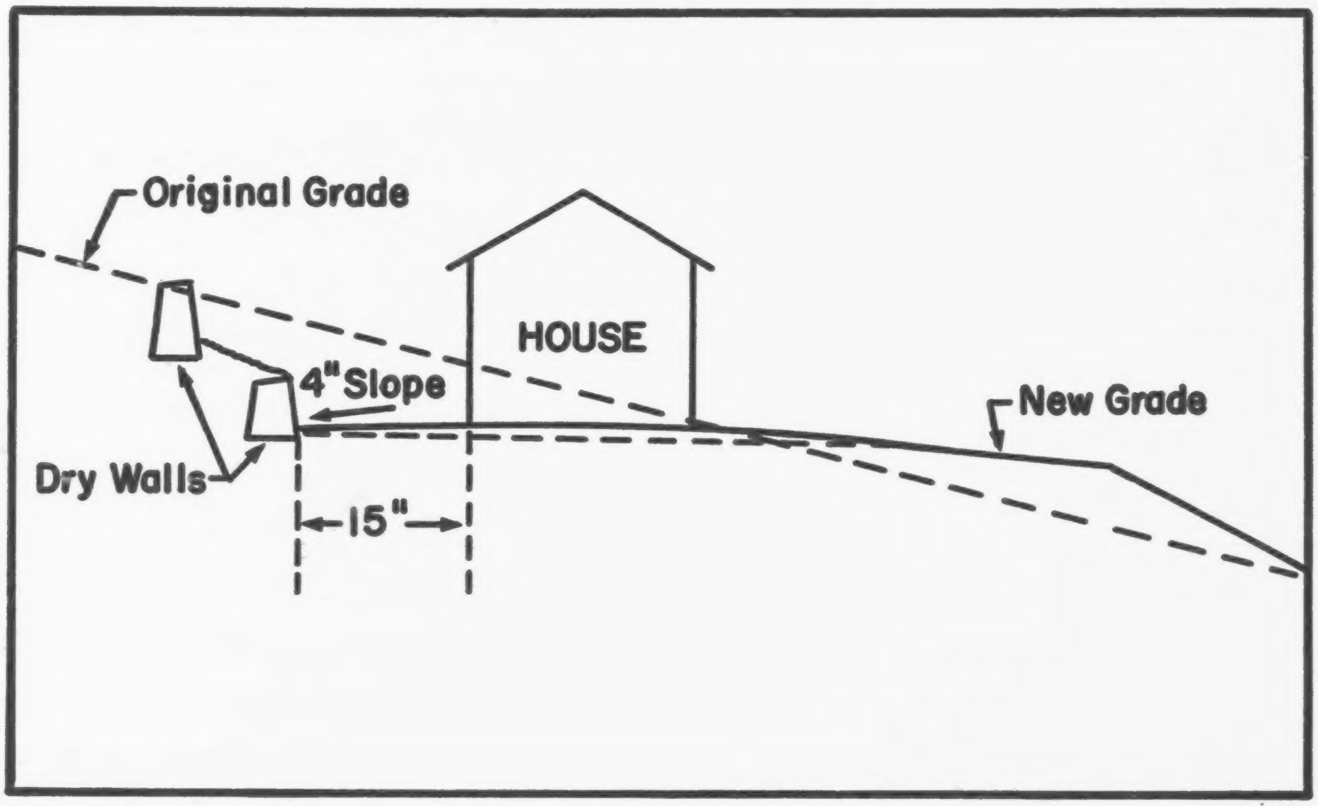


Figure 6. Terrace a steep slope by cutting and filling.

Good drainage is also necessary for proper plant growth. The usual pitch of a lawn or planting surface is two percent or ¼ inch slope per foot. The minimum pitch is about one percent or 1/8 inch slope per foot. Paved surfaces usually need the same amount of pitch, but they are often constructed with the minimum pitch instead of the maximum pitch.

Trees should be protected during all grading work. They may be damaged by breaking up the root system, wounding the trunk, or raising the soil level around the tree.

To prevent wounds to the trunk, wooden fences can be built around the tree. The fences should extend around the tree at a distance equal to the length of the branches to prevent any serious damage to the root system. Tying old rubber tires or boards around the trunk prevents wounds on the trunk, but does not protect the root system.

Trees are also damaged by raising the soil level in which they are growing. If changes in grade raise the soil level around a tree, a dry well should be constructed around the tree. The clearance between the side of the dry well and the tree is determined primarily by the maturity of the tree. Older trees need less clearance than young trees. Before the grade is raised, extend 3 to 5 radiating rows of drainage tile from the base of the dry well to the drip line of the tree (branch tip spread). After covering the drainage tile joints with tarpaper, back-fill with porous material. The grade can then be raised to the proper level without cutting off air to the roots or causing bark rot (see Figure 7).

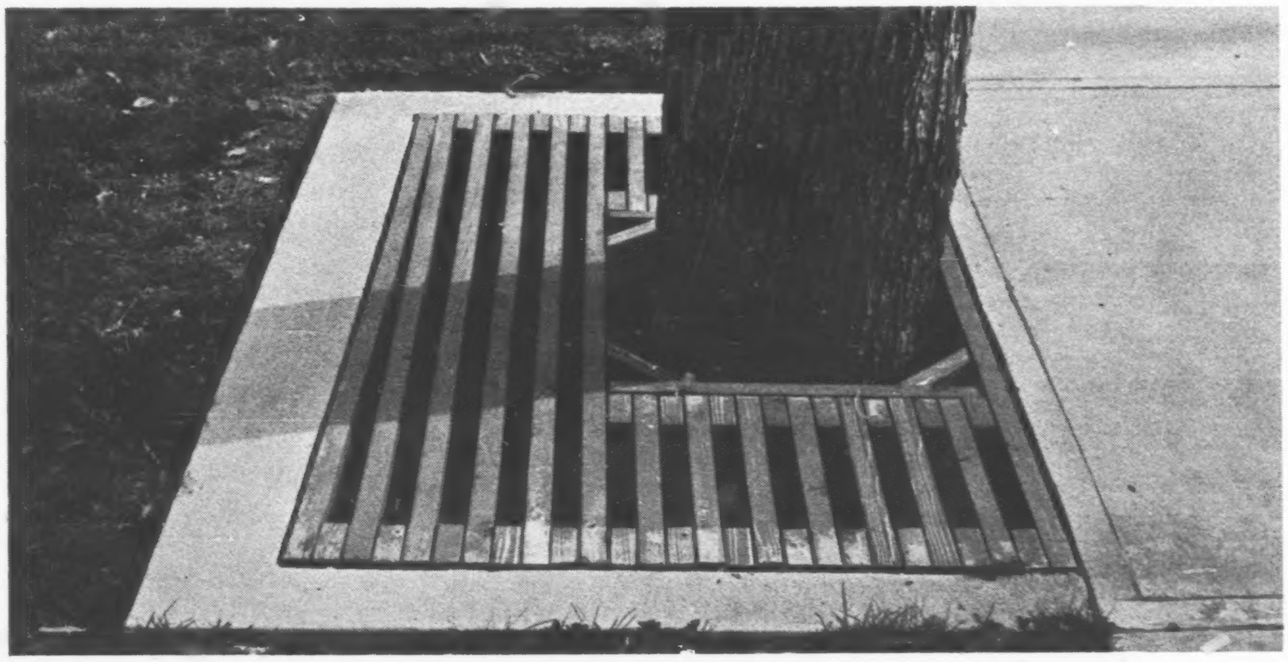


Figure 7. If the grade is raised, build a dry well around trees.

Further details on grading are given in A Guide to Home Landscaping, Reference No. 1, pp. 24-44, and The Art of Home Landscaping, Reference No. 29, pp. 113-127.

Installing Drainage Systems

Proper drainage is required to prevent soil water from depriving plant roots of oxygen. Normally the grade of the site will provide enough drainage, but occasionally underground drainage systems are needed. To determine whether drainage lines might be needed, dig several holes at wide intervals in the property. They may be dug with a post-hole digger to a depth of 18 inches. They should then be filled with water to the rim. If the water does not drain completely in 30 minutes, a drainage tile system should be installed. Drainage tile is usually placed 2 to 3 feet below the soil surface and sloped downward. A downward slope of 1/8 inch per foot will direct the water to either lower areas on the site, into a cistern, or into an existing drainage line. Place the joints nearly together and cover with tarpaper. Cover the whole line with several inches of porous material and back-fill the trench. Drainage lines are usually place 15 to 20 feet apart in parallel lines.

Constructing Landscape Structures

Drives, Walks, and Patios

Surfaced areas must be built on a proper foundation if they are to give lasting service. Concrete and asphalt should be laid on a 4 to 6 inch base of crushed rock, cinders, or similar material. Providing the proper base material will increase the life of the drive or walk by insuring good drainage and reducing frost damage. The thickness of asphalt or concrete needed depends on the weight of traffic it must bear. Walks and patios should have at least 3 inches of base material covered with 2 inches of asphalt or 4 inches of concrete. Driveways should have a minimum of 6 inches of gravel for base material. They should be covered with 2 inches of asphalt or 6 inches of concrete. Driveways, walks, and patios should be crowned or pitched slightly to insure good drainage. Concrete construction is pitched and asphalt construction is crowned.

Brick, patio blocks, flagstone, and similar materials are often used to make walks and patios. Laying these materials without mortar joints is quite common. Instead of mortar, the joints are filled with sand or pebbles. This type of paving also needs a foundation of base material. If the location to be paved is poorly drained, drainage tile should be installed under the paved area to prevent water accumulation and subsequent frost heaving. In such cases, 1-1/2 to 2 inches of sand is firmed and leveled as a cushion on top of the base material. Then, the flagstone or brick are laid directly on the sand.

Although it requires much more maintenance, some people prefer patios with grass joints. In this case, the foundation course is not used. A mixture of 4 to 6 inches of equal parts of topsoil, sand, and peat is used instead. The same material is used to fill the joints. In this case, joints should not be less than 2 inches wide.

For further details, read A Guide to Home Landscaping, Reference No. 1, pp. 45-59, Handbook of Garden Construction, Reference No. 19, Sunset - Garden and Patio Building Book, Reference No. 28, and The Art of Home Landscaping, Reference No. 29, pp. 127-142.

Retaining Walls

Walls and walks can be made of concrete. Stone walls may be built with or without mortar. Those without mortar are known as dry walls.

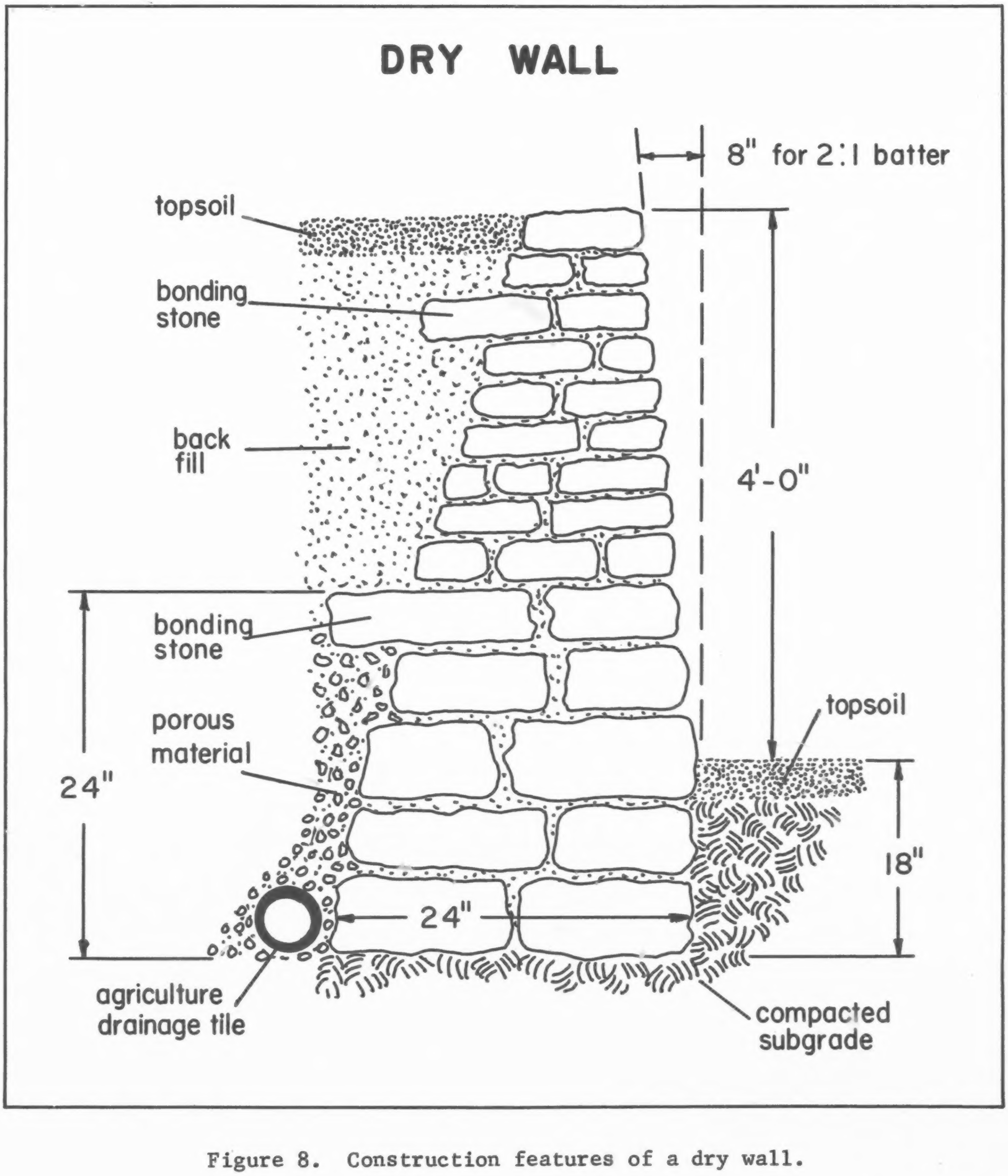

DRY WALL
8" for 2:1 batter
topsoil
bonding stone
back fill
4'-0"
bonding stone
porous material
24"
topsoil
18"
24"
agriculture drainage tile
compacted subgrade

Figure 8. Construction features of a dry wall.

When constructing a dry wall, use the following rules:

1. The base, commonly called a footing, should be well drained to prevent pressure caused by water collecting behind the base of the wall. If a soil is not well drained, install drainage tile at the base of the footing.
2. Use the largest stones for the base of the wall. The size of the stones should become smaller toward the top of the wall.
3. Slant the wall back toward the bank at a rate of 2 inches per foot of height.
4. Dry walls are not used for heights over 5 feet, because the pressure behind the wall becomes so great that they collapse.
5. Stones are often laid in patterns which emphasize horizontal lines.

Retaining walls may also be of railroad ties and other materials.

Free Standing Walls

When constructing walls, the factors of size, shape, texture, and color must be considered. Poured concrete walls also may be used in the landscape. Masonry walls of brick or stone are used to provide privacy and to set off patios and boundaries. These walls demand masonry construction skills to assure a firm foundation, strength, and a finished appearance.

Fences

Fences may be of many shapes and styles. Wood and metal are the two most common structural materials. Wooden fences, except for white cedar, redwood, chestnut, and cypress, should be painted or stained. Wooden support posts should be treated with a preservative. Both wooden and metal uprights (support posts) should extend below the frost line and are often set in collars of concrete. The distance between uprights is usually 8 feet, but this may vary with the type of fence.

Steps and Ramps

Detailed instructions for step and ramp construction are given in Handbook of Garden Construction, Reference No. 19.

Water

The special construction of water features in a landscape are given in Garden Pools, Fountains, and Water Falls, Reference No. 13.

Soil Modification

Before transplanting nursery stock, soil tests should be taken. This is done to determine whether levels of fertility and the pH of the soil need to be modified. All plants do not thrive under the same conditions. Soil test results can be a guide for modifying the soil conditions to meet the needs of special plants. Soil samples should be taken from several points on the site. Avoid unusual parts of the site such as exposed subsoil. Samples from these unusual areas would not be representative of the site and should be sampled separately.

Trees and shrubs grow best in soils that are granular and friable. If the soil structure is not friable, roots may not develop normally. The ideal soil for root development has fine particles of silt and clay bound together into larger aggregates or granules. A soil of this type absorbs water quickly, is well aerated, and retains enough soil moisture. If plant nutrients are available, plants grow well in this type of soil structure.

Heavy soils of clay and light soils of sand and gravel need to be modified before transplanting nursery stock. Heavy clay soils tend to compact and result in poor aeration. The compact soil structure restricts root growth and the poor aeration interferes with necessary growth processes. Adding organic matter such as peat moss, wood chips, chopped straw, or sawdust reduces the soil compaction. Mix 1 part of organic matter with 4 parts of soil. The modified soil should be filled under and around the plant.

Light soils dry out rapidly and some of the nutrients are leached by heavy rains. A better soil structure needs to be developed in light soils to enable them to retain more nutrients and water. This can be done by mixing decomposed organic matter into a light soil.

Buying Nursery Stock

Nursery stock can be obtained from retail or wholesale nurserymen. The most important source of plant materials is a good nurseryman. With the landowner's permission, plant material is sometimes collected from its native environment.

Grading Nursery Stock

Nursery stock are graded to insure quality for the customer. Nurserymen have adopted the grading standards printed in American Standards for Nursery Stock, Reference No. 2, a publication published by the American Association of Nurserymen.

The age and size of the plant are used to grade nursery stock. The size of the plant may refer to its height, caliper (diameter) of stem, spread of foliage, number of branches, or root system.

In general, nursery stock is graded by age, size of the top, and root system. Measurements of height, caliper, top spread, branching of top and root system, and method of propagation are also used in grading. For balled and burlapped stock, the size of the ball is included. When heights are given, the measurement is from the ground line or from the collar to the tip stem. The diameter or, as often expressed in trade terms, the caliper is measured at varying distances above the ground. This measure depends on the class of shrubbery or trees.

Consult American Standards for Nursery Stock for the specific grading of plants. Some of the more commonly grown plants are graded as follows:

1. Narrow-leaved evergreen trees are graded by height.
2. Narrow-leaved evergreen shrubs are graded by the diameter of the shrub spread. They may also be graded by the height of the shrub depending upon habit of growth.
3. Broad-leaved evergreens are graded the same as narrow-leaved evergreen shrubs.
4. Deciduous trees and shrubs are graded by height when small. When the trees become larger, they are graded by the diameter of the trunk.

The nursery trade uses abbreviated terms in describing plants. The following abbreviations are commonly found in nursery catalogs. To be able to use a nursery catalog, these abbreviations must be understood.

S = Seedling
T or X = Once transplanted
TT or XX = Twice transplanted
RC = Rooted cutting
RCT = Rooted cutting transplanted

Planting Ornamentals

Plants are planted as bareroot, balled and burlapped, or container grown stock. Most deciduous shrubs and young deciduous trees are planted bareroot when dormant. Usually, one-third of the top is removed to allow for the loss of roots during digging. Bareroot plants should be planted in early spring before leaves develop. Or, they can be planted in the fall after the plants begin to lose their leaves. Details are given in A Guide to Home Landscaping, Reference No. 1, pp. 117-139, and Approved Practices in Landscaping the Home Grounds, Reference No. 4, pp. 151-180. Details on garden roses are given in Roses for Every Garden, Reference No. 26, pp. 77-83.

Trees with thin or smooth bark may not be hardy enough to be transplanted in the fall. The following trees should not be transplanted in northern areas in the fall: beech, birch, dogwood, elm, linden, red maple, and sugar maple. The following species may safely be planted in the fall: magnolia, poplar, sweetgum, and tuliptree.

The soil filled in around transplanted trees and shrubs should be in good physical condition. No fertilizer should be added to the transplanting. Damage may result if fertilizer is applied during the first season of growth.

Transplanting Trees

Dig a hole for planting bareroot stock which is deeper and wider then the root system. If the roots are forced into a small hole, they will be restricted and will not grow properly. After checking the size of the root system, dig a hole 6 inches deeper than necessary and 6 inches wider then the root system. Inspect the root system and cut off any roots that are broken or damaged. All nursery stock should be planted at the same depth as it was grown in the nursery. The depth that the plant was grown can be observed by looking for the soil-line color change at the base of the trunk. Fill soil into the hole until the desired depth is reached for planting. This prevents the plant from being placed on a hardpan, and it allows the soil under the plant to be modified if necessary. Put the plant in the hole and spread the roots into their natural growing position. All the soils filled in around the roots of the plant should have good soil structure or be modified with organic matter.

Large trees are planted balled and burlapped. They are planted in the same manner as bareroot trees. Extra effort is involved because of the soil weight (1 cu. ft. = 100 lbs.). Great care must be taken not to crack the soil ball, as this would severely damage the root system. If moved in mid-winter, the frozen soil ball of large trees is less likely to crack.

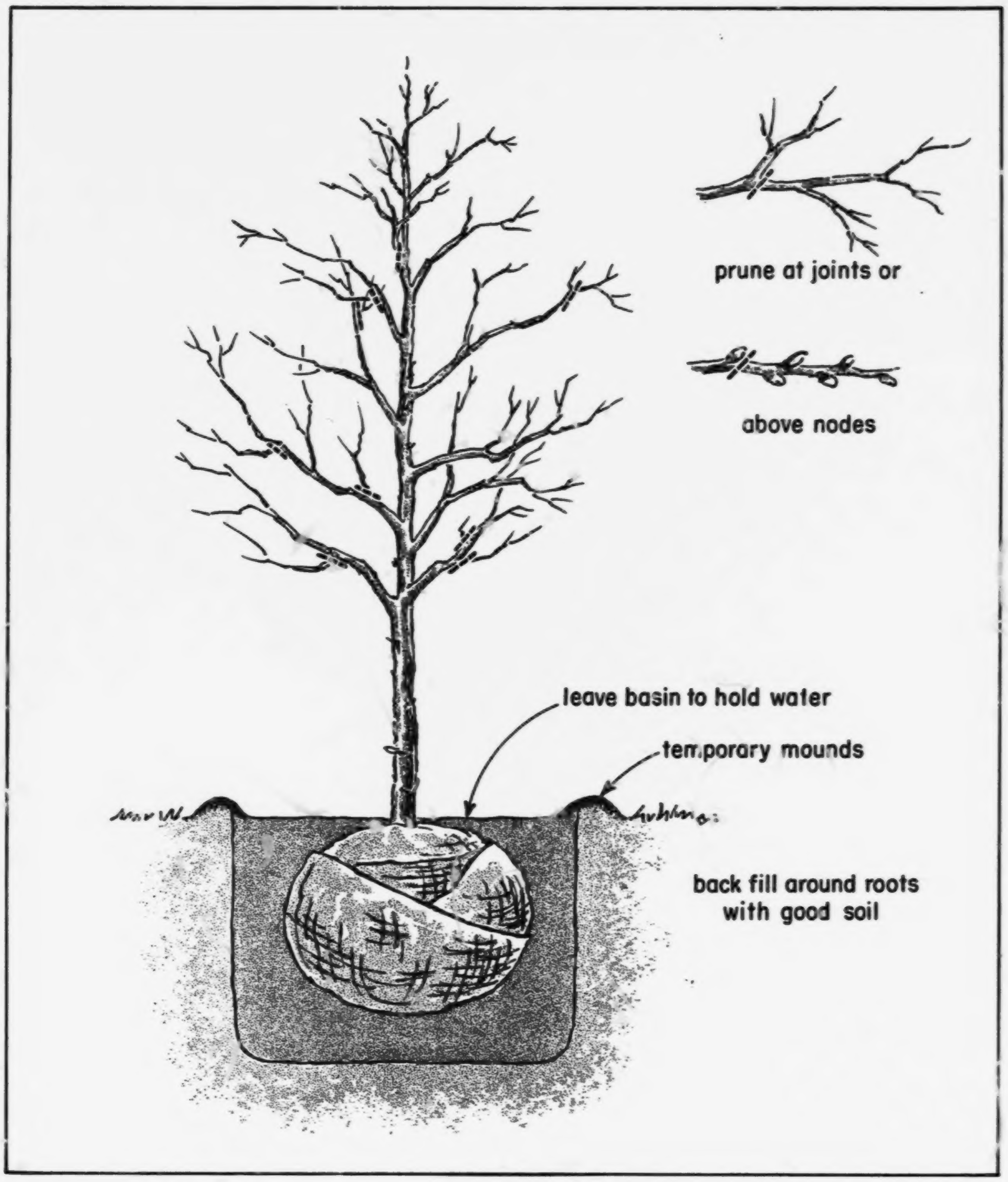

prune at joints or
above nodes
leave basin to hold water
temporary mounds
back fill around roots with good soil

Figure 9. A tree should be transplanted in a hole about 6 inches wider than the ball.

Shovel topsoil into the hole until it is two-thirds full. Firm, but do not pack, the soil and thoroughly water. After the water has settled, fill the hole level with the ground line. Do not mound the soil near the stem of the plant. Form a saucer-shaped basin to help direct water to the root system. Cut off one-fourth to one-third of the lateral branches, but keep the natural shape of the plant. This pruning reduces the leaf area.

2

The transpiration rate (water loss) is reduced to make up for the reduced capacity of the root system to supply water. Trees that were root pruned while growing in the nursery have a more compact root system. With these, little or no top pruning may be needed. Do not prune the leader (top shoot) or any short branches growing directly from the leader.

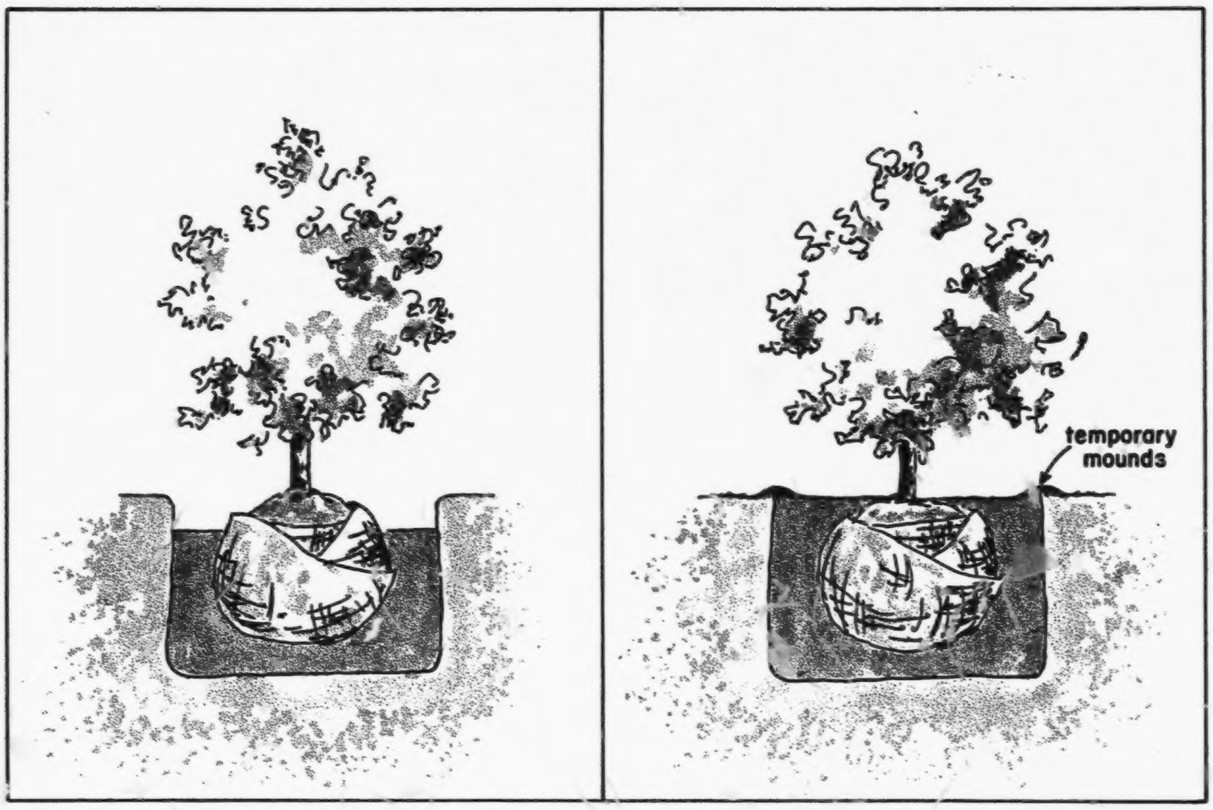


Figure 10. The burlap should be loosened, but not removed from the ball. A saucer-shaped basin around the plants prevents water run-off.

Wrapping and Staking Trees

Drying winter winds and sudden changes in winter temperatures are harder on some plants than extreme low temperatures. The trunks of trees with thin smooth bark such as young maples, lindens, planetrees, beeches, birches, pin oaks, and mountain ash should be protected by wrapping special types of paper or burlap around them. If this is not done, bark splitting or dead patches of bark may occur. Plastic emulsion sprays often recommended for this purpose are not as effective as burlap or Kraft paper. Several types of paper are commonly used for wrapping the trunks of trees. If burlap is used for wrapping, the edges should be folded under to prevent birds and the wind from unravelling the burlap. The trunk of the tree is usually wrapped by starting at the top and working down in the form of a spiral. The wrapping is held in place with a strong string wound in the opposite direction. The wrapping is usually left on the tree for at least two years. It should be removed in early spring after the second winter.

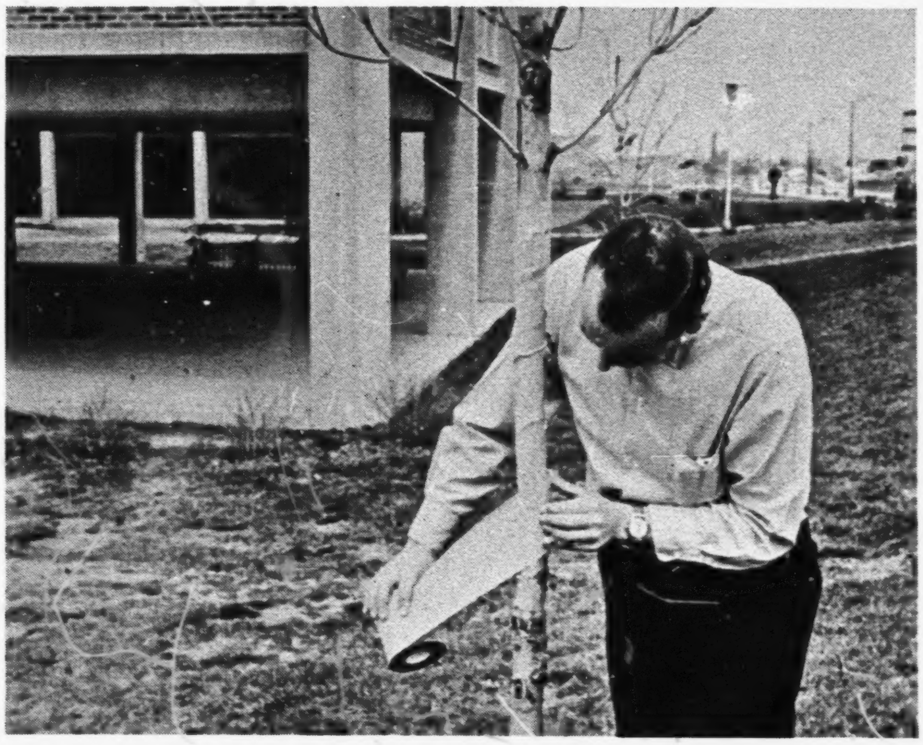


Figure 11. Newly transplanted trees should be wrapped for winter protection.

Trees which have just been planted should be protected against the whipping action of the wind. A newly planted tree has a limited root system and is poorly anchored into the soil until new roots grow. If a newly planted tree is always swayed by the wind, the roots cannot become anchored in the soil.

Several types of guy wires and stakes are used for support. They include a single stake or double stake arrangement and three or four guy wires anchored to the ground. Wires used to help anchor trees must be covered at points of contact on the tree with old sections of garden hose or similar protective materials. A single stake is used with trees whose trunks are less than 2 inches in diameter. The stake must be strong enough to support the tree, but yet have some flexibility. It must not interfere with the growth and development of the root system. The top of

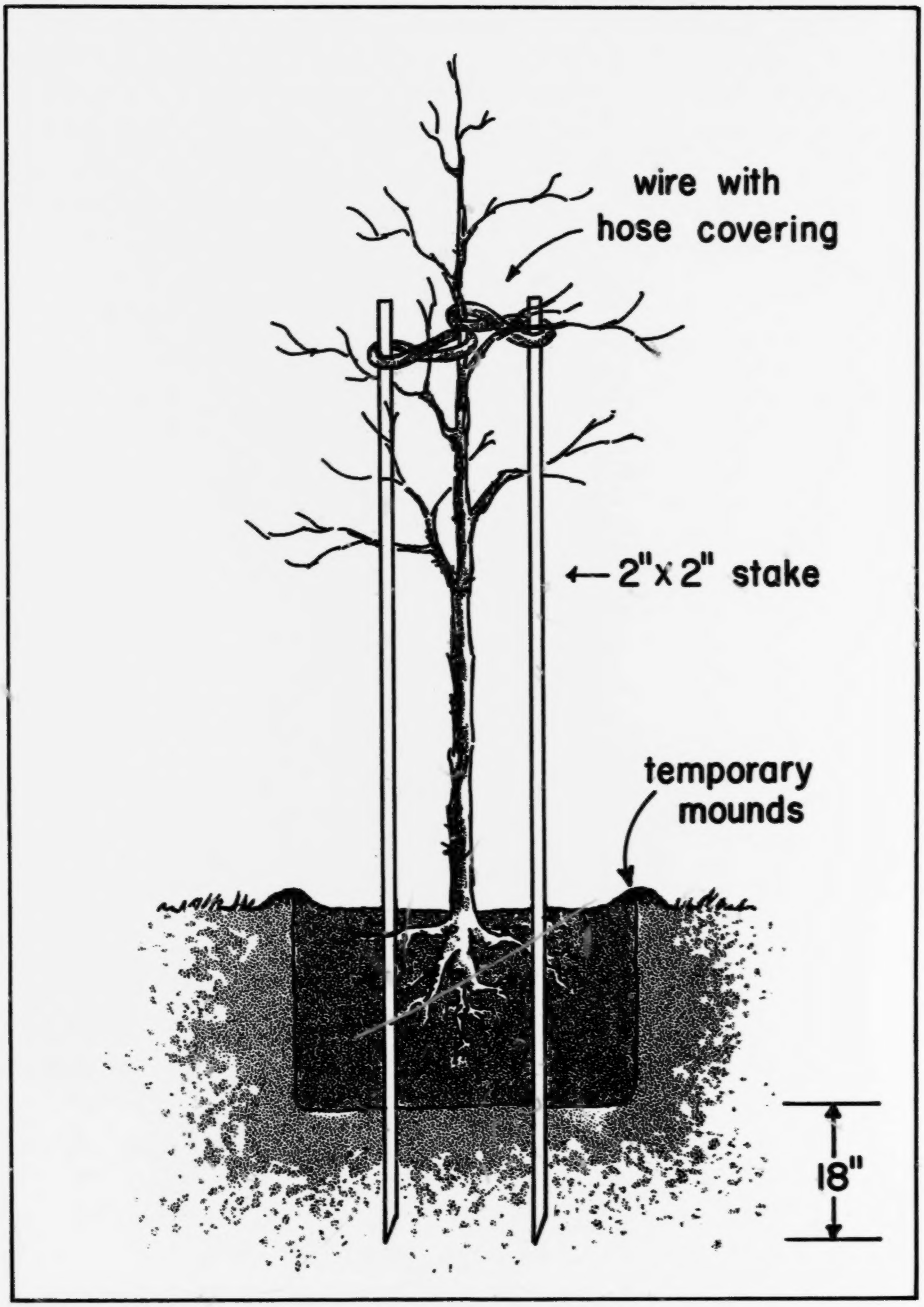

wire with
hose covering
← 2"x 2" stake
temporary
mounds
18"

Figure 12. Newly transplanted trees should be staked to protect the plant from wind damage.

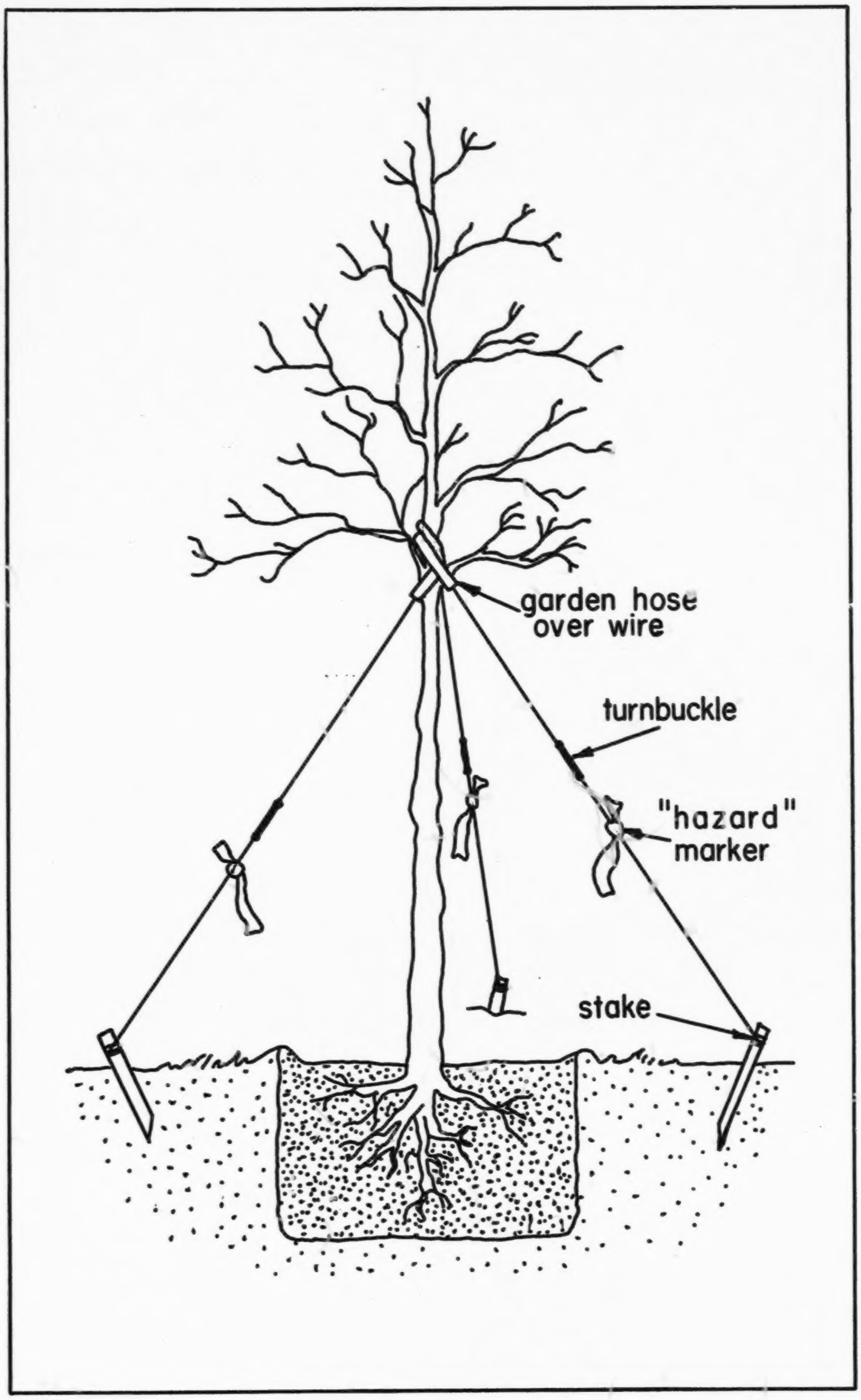

garden hose
over wire
turnbuckle
"hazard"
marker
stake

Figure 13. Large trees should be guyed after transplanting.

the support stake should be about half the distance between the bottom branch and the top of the tree. Place the stake 1 foot from the tree trunk and drive it at least 18 inches below the root system of the tree. Tie the tree to the stake with wire (see Figure 12).

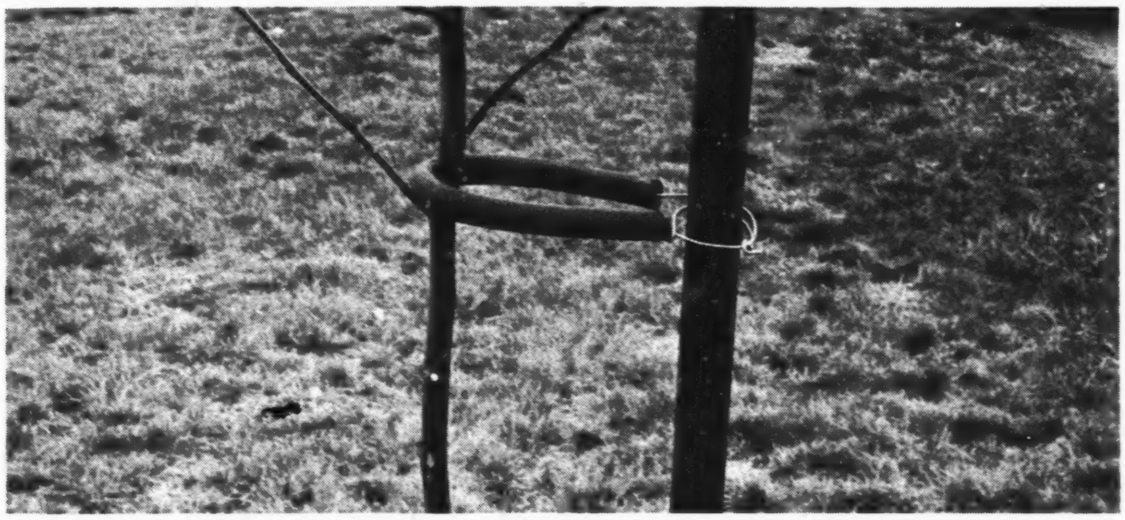


Figure 14. Use rubber hose to prevent girdling of the tree.

Three or four guy wires are used for trees that are over 4 inches in diameter. Cable or Number 10 wire is attached to the tree. Running the wire or cable through a piece of garden hose protects the trunk. Secure the wires to short stakes evenly spaced 6 to 8 feet from the base of the tree (see Figure 13).

Transplanting Shrubs

Many deciduous shrubs are transplanted bareroot while in a dormant condition. Great care must be taken that the root system does not dry out during the planting operation. Soaking the roots in water for an hour or two before planting is a common practice. They are handled and planted in the same manner as bareroot trees.

Different planting techniques are used in planting nursery stock for hedges. Since plants in a hedge are spaced close together, it is easier to dig a trench than to dig individual holes. The trench should be 1½ to 2 feet wide or larger. The size of the trench depends on the size of the stock being planted. It should be several inches deeper than the plant's root system. Other procedures for planting are the same as discussed for bareroot or balled and burlapped material.

Nursery stock being planted for a hedge should be spaced from 6 inches to 4 feet apart, depending on the plant species. The following is the proper spacing between several varieties of nursery stock used for hedges: Japanese barberry, 1 to 2 feet; Van Houtte spirea, 2 to 3 feet; dwarf English yew, 2 to 3 feet; Canadian hemlock, 2 to 4 feet; Japanese holly, 2 feet; yews, 2 to 3 feet; and California privet, 1-1/2 feet.

Plants dug with a ball of soil around their roots are called "balled and burlapped" plants. Almost all evergreen plants, some deciduous plants, and some large shrubs are transplanted with a ball of soil around their roots. The soil is held in place by wrapping the ball with burlap. Some plants are grown and sold in containers. Container grown stock and balled and burlapped stock are transplanted without disturbing the root system. This allows them to be transplanted any time that the ground is not frozen. Many people prefer to plant in the spring. Planting in the spring gives the plant time to become well established before winter. Container grown stock is planted the same way as balled and burlapped stock. Before planting, remove the container from around the roots in a manner that does not disturb the root system. Roses are handled in the same manner as small shrubs except that bareroot ones are mounded with the soil to keep the canes from drying out before the roots become established. The mounds must be removed as soon as the shoots begin to grow.

Balled and burlapped stock should be planted immediately after receiving them. If they must be held a few days, the plants should be held in a cool, shady place. The ball of earth around the roots must be kept moist. "Balled and burlapped" or "container" plants should be handled by the ball of earth or container to avoid breaking the roots. Dropping the plants causes damage by loosening the soil around the roots and breaking them.

Balled and burlapped plants and container plants are planted in the same manner as bareroot plants with a few changes. A small mound of soil should be placed in the middle of the hole to regulate the depth of the plant. When the plant is set in the hole, the top of the ball should be at the ground level.

It is not necessary to remove the burlap before planting. The plant's roots can grow through light-weight burlap if it had not been treated with a rot-preventing chemical before it was used. The burlap should, however, be loosened at the top.

Cover the saucer-shaped basin with 2 to 3 inches of a good mulch, such as peat moss. Balled and burlapped plants are not pruned after planting since most of the roots are intact. Some of these plants will not produce new growth from stems over 2 years old, thus pruning them could severely damage the plant.

Evergreen shrubs should be protected from cold injury the first winter after planting. Do this by erecting burlap screens around them (particularly on the south side which is subjected to temperature stresses). Another method of protection is to erect branches from used Christmas trees.

Planting Ground Covers

Ground cover plants are planted 9 to 12 inches apart in the area to be covered. They are often planted as individual plants that have been started in small containers. The containers are removed in the planting process. The plants are set at the same depth at which they originally grew. Some kinds, particularly English ivy, may be planted as rooted cuttings. Myrtle is often planted by separating large clumps into smaller pieces. All ground-cover plantings should be mulched and watered immediately after planting.

Planting Vines and Espaliers

These plants are planted in the same manner as woody shrubs, except that some kind of support is needed. Clinging types may be held in place against a stone or brick wall. They are attached by means of small hooks or plastic buttons designed especially for this purpose until they have grown enough to develop new clinging organs. Twining plants require an open supporting structure such as a trellis, fence, or railing. They are usually tied in place to help them get started.

Espaliers and "climbing" roses are tied to a heavy support. It may be a framework of 1/4 - inch pipe, a heavy wooden trellis, or a sturdy fence. Espaliers are often trained in formal patterns which may take 5 to 10 years to complete. The framework support for them must be carefully planned and constructed. Training espaliers requires special skills you may wish to develop later.

Planting Herbaceous Plants

Each of the three kinds of herbaceous plants, annuals, bulbs, and perennials have different planting requirements. See Basic Gardening Illustrated, Reference No. 5, pp. 27-44.

Annuals are planted in window boxes, planters, "patio" containers, in beds by themselves, or with perennials and bulbs. They are planted in mid-May and bloom until frosts kill them in the fall. A 5-10-10 or 6-12-12 fertilizer at 2 lbs. per 100 sq.ft. should be mixed into the soil before planting and the plants should be thoroughly watered after planting is completed. The plants should be spaced appropriately (see Appendix F, p. 38) and planted at the depth at which they first grew.

Flowering bulbs may be expected to give blooms for many years. They are planted in September or October. They are often planted in beds of ground covers to give spring color. They are sometimes planted in beds by themselves. Annuals may be added among them in the spring to prolong a colorful effect all summer. The usual kinds are planted 6 to 8 inches deep and the same distance apart. Bulbs should be set with the pointed part up.

Perennials are considered permanent plants and may be planted in groups of three to five of a kind in a ground cover. Also, they are often planted in beds in combination with annuals and bulbs. Spring-flowering perennials, such as garden chrysanthemums, are planted in the spring. Regardless of their flowering time, all container-started perennials may be planted in early spring. They should be planted at the appropriate spacing and at the depth at which they originally grew. They should be thoroughly watered after planting.

Turf Establishment

Turf may be established by sowing seed or by laying sod. Seed sowing is less expensive, but requires about 6 to 9 months of good growing weather before a good turf is established. Laying of sod will result in a well-established turf in one month to six weeks. The details of turf establishment are so extensive that they cannot be included here, but may be found in Turf Establishment, A Student Handbook, Department of Agricultural Education, The Pennsylvania State University, and Approved Practices in Landscaping the Home Grounds, Reference No. 4, pp. 69-97.

Suggestions and References for the Teacher

Landscape establishment includes location and establishment of plants and structures on the site in accordance with the landscape design. The use of proper practices in landscape establishment is necessary for the survival and health of the plant materials.

Learning Resources

References:

A Guide to Home Landscaping, Reference No. 1, pp. 24-44 and pp. 117-139.

American Standards for Nursery Stock, Reference No. 3.

Approved Practices in Landscaping the Home Grounds, Reference, No. 4, pp. 69-97 and pp. 151-180.

Basic Gardening Illustrated, Reference No. 5, pp. 27-44.

Garden Pools, Fountains, and Water Falls, Reference No. 13.

Handbook of Garden Construction, Reference No. 19, pp. 45-59.

Roses for Every Garden, Reference No. 26, pp. 77-83.

Sunset - Garden and Patio Building Book, Reference No. 28.

The Art of Home Landscaping, Reference No. 29, pp. 247-256 and pp. 113-142.

Supplies:

1. Hand tools: spades, rakes, hoes, hammer
2. Wheelbarrow
3. Stakes, twine, tree wrapping material
4. Rules, tape, spirit level
5. Fertilizer, peat moss, and mulch

Suppliers:

1. Farm supply dealers
2. Building material dealers
3. Nurseries

Suggested Learning Activities

1. Provide opportunities for each student to plant specimens of balled and burlapped, bareroot, and container grown stock.
2. Provide each student an opportunity to work with dry wall construction.
3. Develop student practice exercises in determining the rise and run of steps for different slopes.

4. Organize laboratory periods for laying brick, flagstone, gravel, and other materials.
5. Allow students to practice taking soil tests and to determine if the soil should be modified before establishing plant materials.
6. Have students stake and wrap trees.

Suggested Placement Experiences

1. Develop a planned work experience program which allows students the opportunity:
   a. To take soil tests and suggest modification needs.
   b. To build dry walls as retaining structures and dry wells around trees to protect against changes in grade.
   c. To aid in the construction of walks, patios, fences, and other structures.
   d. To aid in the location and planting of evergreen and deciduous trees, shrubs, and groundcovers.

Test

1. How are trees protected during and after grading operations?
2. Describe the procedure used for building a dry stone wall.
3. What soil modification is necessary before planting shrubs and trees in "heavy" soils?
4. Describe how balled and burlapped stock is planted.
5. What should be the minimum thickness for a concrete driveway? For an asphalt driveway? For a concrete walk?

List of References

1. A Guide to Home Landscaping. Bushey, D. J. McGraw-Hill, New York. 1956.

2. America's Garden Book. Bush-Brown. Scribner's, New York. 1958.

3. American Standards for Nursery Stock. American Association of Nurserymen, Inc., 835 Southern Building, Washington, D. C. 1957.

4. Approved Practices in Landscaping the Home Grounds. Hoover, Norman K. Interstate Printers and Publishers, Inc., Danville, Illinois. 1966.

5. Basic Gardening Illustrated. Sunset Book Series. Lane Book Co., Menlo, California. $1.95.

6. Careers as Landscape Architect and Landscape Nurseryman. Research Number 13. The Institute for Research, 537 South Dearborn Street, Chicago, Illinois.

7. Course 131. Landscape Planning for Small Properties. Wilson, Wayne. Correspondence Courses in Agriculture and Home Economics, The Pennsylvania State University, University Park, Pennsylvania.

8. Course 135. Trees for the Home Grounds. Haldeman, W. L. Correspondence Courses in Agriculture and Home Economics, The Pennsylvania State University, University Park, Pennsylvania.

9. Course 137. Shrubs for the Home Grounds. Haldeman, W. L. Correspondence Courses in Agriculture and Home Economics, The Pennsylvania State University, University Park, Pennsylvania.

10. Course 140. Vines, Ground Covers, and Espaliers. Haldeman, W. L. Correspondence Courses in Agriculture and Home Economics, The Pennsylvania State University, University Park, Pennsylvania.

11. Diseases and Pests of Ornamental Plants. Pironne, Dodge and Rickett. (Third Edition). Ronald Press, New York. 1960.

12. Garden Plans. Sunset Book Series. Lane Book Co., Menlo, California.

13. Garden Pools, Fountains, and Waterfalls. Sunset Book Series. Menlo Book Co., Menlo, California. 1965. $1.95.

14. Gardening in Containers. Sunset Book Series. Menlo Book Co., Menlo, California. $1.95.

15. Ground Cover Plants. Wyman, D. Macmillan, New York. 1956.

16. Grounds Maintenance Handbook. Conover, H. S. F. W. Dodge Corporation, New York. 1958.

17. Handbook of Agricultural Occupations. Hoover, Norman K. Interstate Printers and Publishers, Inc., Danville, Illinois. 1963.

18. Handbook of Mulches. Brooklyn Botanic Garden, Brooklyn, New York. $1.00.

19. Handbook on Garden Construction. Brooklyn Botanic Garden, Brooklyn, New York. $1.00.

20. Ideas for Entryways and Front Gardens. Sunset Book Series. Lane Book Co., Menlo, California. 1961. $1.50.

21. Nursery Production and Landscape Maintenance. Robinson, William A., and others, Department of Agricultural Education, College of Agriculture, The Pennsylvania State University, University Park, Pennsylvania.

22. Operating a Garden Center. Pinney, John J. American Nurseryman, Chicago, Illinois. 1963.

23. Plant Hardiness Zone Map. Misc. Publ. 814, U. S. Department of Agriculture, Washington, D. C.

24. Pronouncing Dictionary of Plant Names. Florists' Publishing Co., Chicago, Illinois. 1966. $ .35.

25. Pruning Handbook. The Brooklyn Botanic Garden. Brooklyn, New York. $1.00.

26. Roses for Every Garden. R. C. Allen. Barrows. New York. 1956.

27. Shrubs and Vines for American Gardens. Wyman, Donald. The Macmillan Co., 1959. $8.00.

28. Sunset Garden and Patio Building Book. Sunset Book Series. Lane Book Co., Menlo, California. $7.95.

29. The Art of Home Landscaping. Garrett Eckbo. E. W. Dodge Corp., New York. 1956. $6.95.

30. The Nursery Business. Small Business Bulletin. Small Business Administration, Washington, D. C.

31. The Shrub Identification Book. Symonds, George W. D. M. Barrows and Company, New York. 1963.

32. The Tree Identification Book. Symonds, George W. D. M. Barrows and Company, New York. 1958.

33. Trees for American Gardens. Wyman, Donald. The Macmillan Co., 1965. $8.00.

34. Trees, Shrubs, and Vines. Bulletin No. 43. College of Forestry, Syracuse University, Syracuse 10, New York.

APPENDIX A

Checklist for Selecting Plant Materials

Use ______________________________ Name ______________________________

Form: ____________________________

Size - mature height: ______________

Size - mature spread: ______________

Texture: very fine ____ fine ____ medium ____ coarse ____ very coarse ____

Density: compact _____ medium _____ open _____

Foliage: appears early _____ late _____

drops early _____ late _____

color _______________ fall color _______________

Flowers: size _______ color _______ fragrance _______

Fruit: showy _______ color _______ when appearing _______ use _______

Bark: color _______ texture _______ other ___________________________

Soil preference: sand _______ clay _______ loam _______

Moisture preference: wet _______ dry _______ intermediate _______

Light preference: sun _______ shade _______ semi-shade _______

pH preference: acid _______ alkaline _______ neutral _______ other _______

Rate of growth: slow _______ moderate _______ fast _______

Hardiness: tender _______ semi-hardy _______ hardy _______

Maintenance:

cleanliness ____

pruning ____

fertilization ____

disease ____

insects ____

APPENDIX B

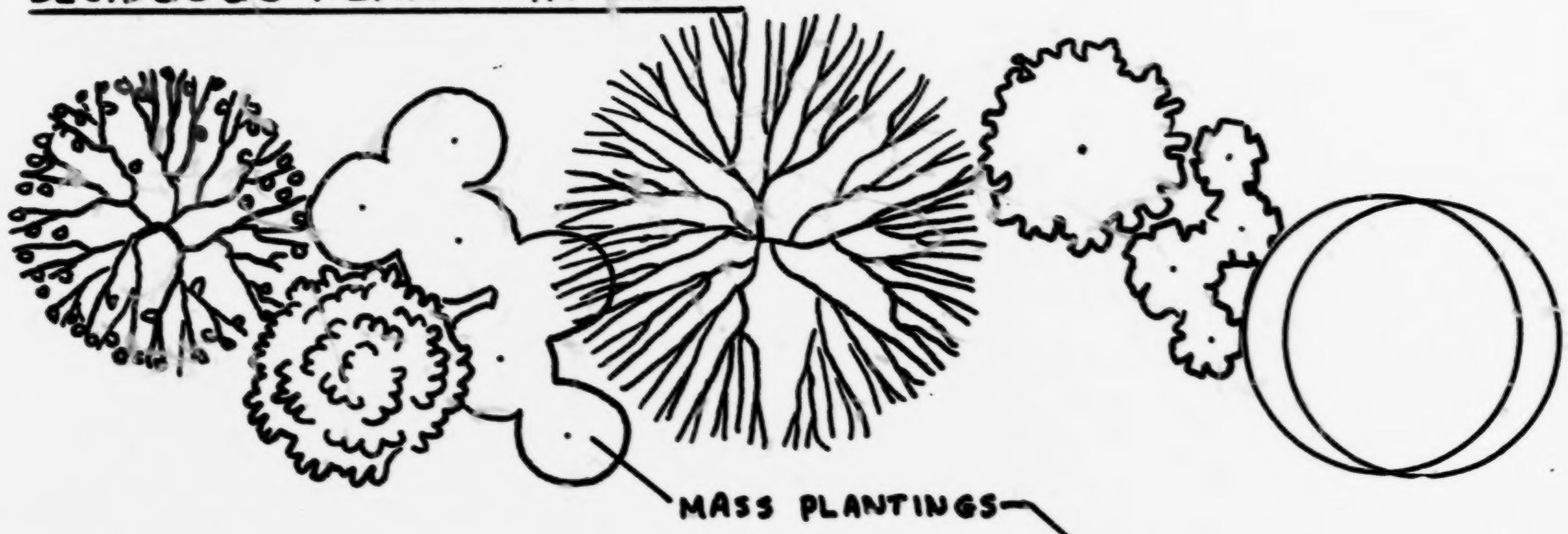
Checklist for Winter Landscape Maintenance

1. Mound soil over rose canes.
2. Drain pools and cover, bird baths also.
3. All dead vegetation should be cleaned up and composted or burned.
4. A good compost bin is in an out-of-the-way area of the property; has soil, manure, etc., added between layers of the plant material you are composting.
5. September is a good time to plant evergreens, divide early blooming perennials, transplant young perennials.
6. Leave soil in a "rough condition" to catch rainfall.
7. Water all evergreens thoroughly before ground freezes.
8. Mulch perennial beds and evergreens. Consider use of materials such as wilt-proof burlap protectors for evergreens.
9. Dig tender bulbs, corm, etc., and dry before storing.
10. Clean equipment, drain gas from power tools (a little oil may be placed in the spark plug hole where it will reach the cylinder).
11. Prune all shrubs that wind whip, rub against each other, or against nearby building walls.

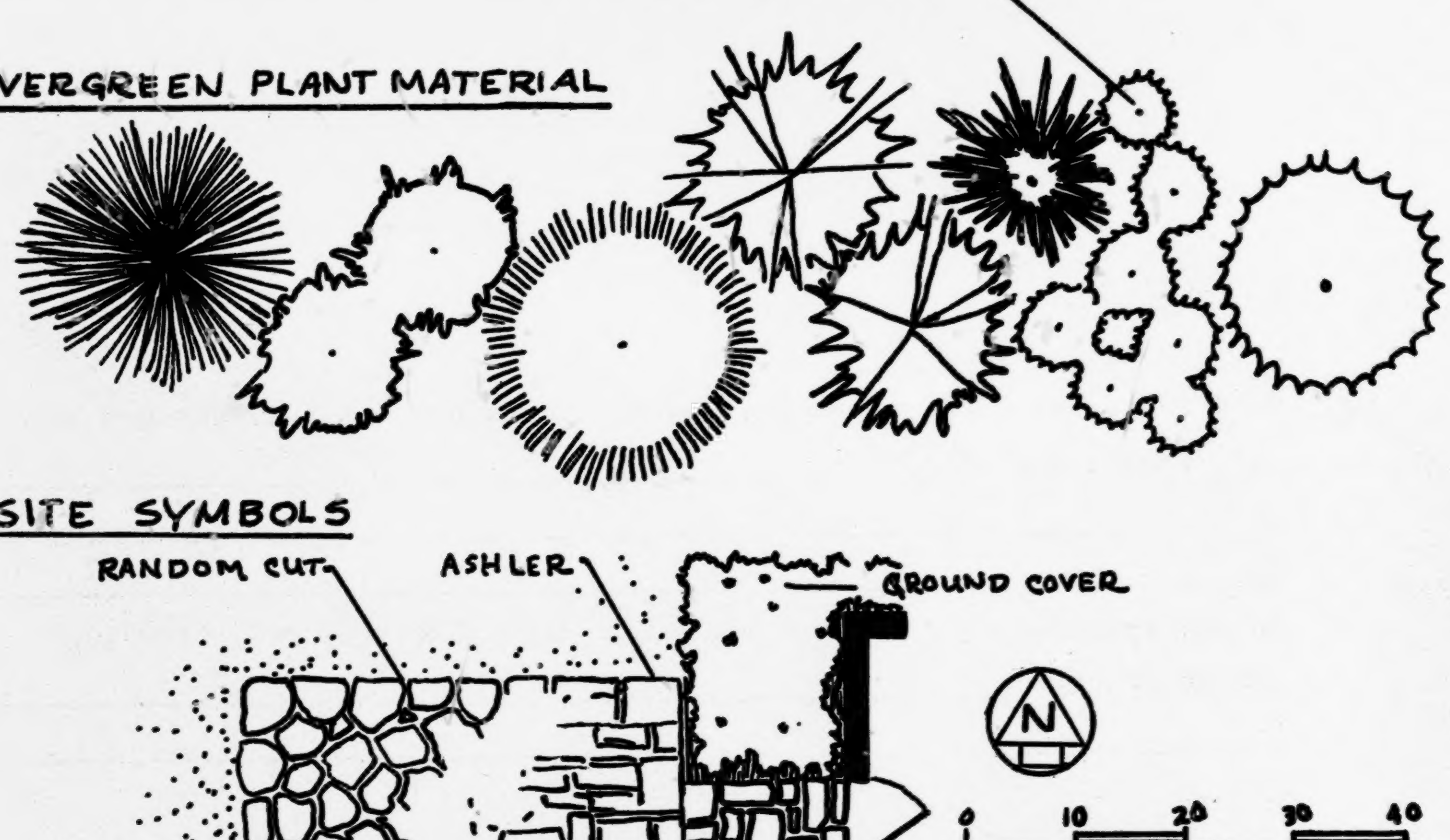
APPENDIX C

Some Landscape Symbols

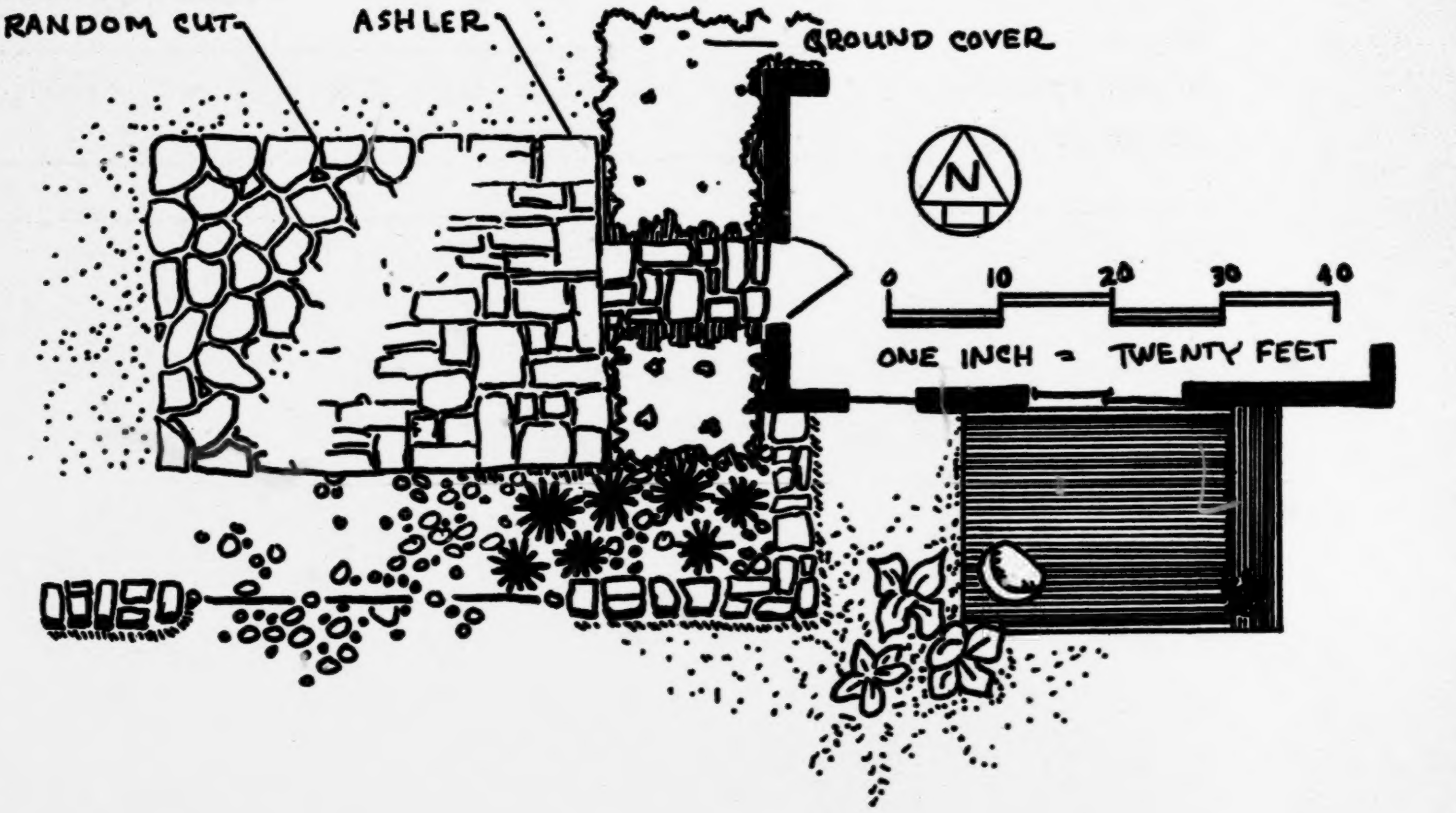
DECIDUOUS PLANT MATERIAL


MASS PLANTINGS

EVERGREEN PLANT MATERIAL



SITE SYMBOLS


RANDOM CUT
ASHLER
GROUND COVER
N
0
10
20
30
40
ONE INCH = TWENTY FEET

APPENDIX D

Diagnostic Check Sheet for Unhealthy Plants

1. How long have the disease or injury symptoms been noticeable?
   ____
2. Was the plant in question:
   a. severely pruned? ____________________
   b. cultivated too deep? _______________
   c. injured by mechanical equipment ______________
3. What was the type, date, and rate of last fertilization? ______________
   ____
   ____
   ____
4. Were weed killers used in the area? ______________
5. Was there sufficient moisture during:
   a. growing season? ______________
   b. past winter? _________________
6. Are there signs of disease or insects on:
   a. roots? ______________
   b. branches? ___________
   c. leaves? _____________
7. Have there been any recent environmental changes (paving, changes in soil depth, etc.)? ____
   ____
   ____
8. Do the symptoms seem to be: Winter injury? Salt injury? Crowding? Canine injury? ____
   ____

APPENDIX E

Addresses for Agricultural Extension Publication Services

MAILING ROOM
Agricultural Extension Service
Agricultural and Home Economics
Experiment Station and Cooperative
Extension Service
Iowa State University of Science and
Technology
Ames, Iowa 50010

Agricultural Extension Service
MSU Bulletin Office
P. O. Box 231
East Lansing, Michigan 48823

Extension Director
College of Agriculture
University of Connecticut
Storrs, Connecticut 06268

MAILING ROOM
Agricultural Extension Service
Agricultural Hall
University of Delaware
Newark, Delaware 19711

Cooperative Extension Director
Agricultural Extension Service
University of Maine
Orono, Maine 04473

Extension Director
Agricultural Extension Service
University of Maryland
College Park, Maryland 20740

Extension Director
Agricultural Extension Service
University of Massachusetts
Amherst, Maasachusetts 01002

Cooperative Extension Director
Agricultural Extension Service
Thompson Hall
University of New Hampshire
Durham, New Hampshire 08324

Associate Director
Agricultural Extension Service
College of Agriculture
Rutgers University
New Brunswick, New Jersey 08900

MAILING ROOM
Agricultural Extension Service
Stone Hall
Cornell University
Ithaca, New York 14850

Extension Director
102 Armsby Building
The Pennsylvania State University
University Park, Pennsylvania
16802

Ag Editor's Office
16 Woodward Hall
University of Rhode Island
Kingstone, Rhode Island 02836

Extension Service Director
Agricultural Extension Service
Morrill Hall
University of Vermont
Burlington, Vermont 05401

Office of Information
U. S. Department of Agriculture
Washington, D. C. 20250

APPENDIX F

Identification and Classification of Plant Materials Commonly Used for Landscape Plantings

IDENTIFICATION AND CLASSIFICATION OF PLANT MATERIALS COMMONLY USED FOR LANDSCAPE PLANTINGS

Everyone involved in landscape design, nursery production, or landscape maintenance and establishment should be able to identify plant materials commonly used for landscaping. Certainly the landscape nurseryman must know the plants which he grows or buys to use in landscape plantings. Garden center workers and salesmen must know plant materials in order to sell effectively. Finally, ground superintendents, park foremen, and landscape workers should know plant materials in order to properly establish and maintain landscape plantings.

There are two methods of identifying plant materials. Each has its merit. The first method is to memorize the appearance of each plant. The second method requires the use of a keyed system of classifying and identifying characteristics of plant materials.

Young people entering landscaping need to acquire rapidly a general knowledge of the trees, shrubs, groundcovers, and vines commonly used in landscape plantings. The visual system is best for the beginner. Later he may want to use the keyed system.

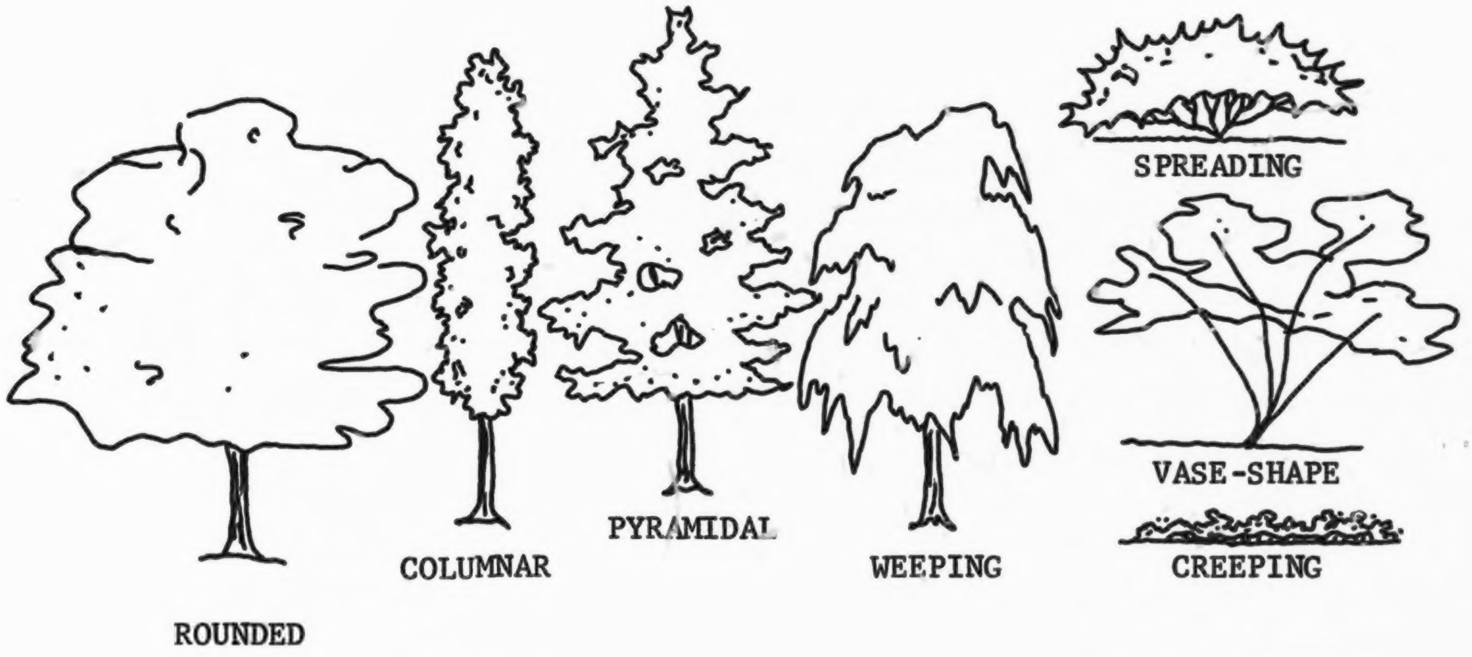
Classifying plant materials according to certain characteristics makes learning easier. These materials can be classified as deciduous (those which drop their leaves in the fall) and evergreen (those which do not drop their leaves). Both may be further classified as broad-leaved or narrow-leaved. Next, they can be classified as trees, shrubs, groundcovers, or vines. Trees may be classified as small or large. Shrubs are usually classified further as small, medium, or large. This classification could be extended as the beginner gains experience.

The beginner should learn a few plant materials in each category. For example, he should learn three broad-leaved evergreen trees and three broad-leaved deciduous trees, etc. From this limited beginning, other materials can be learned as more experience is gained.

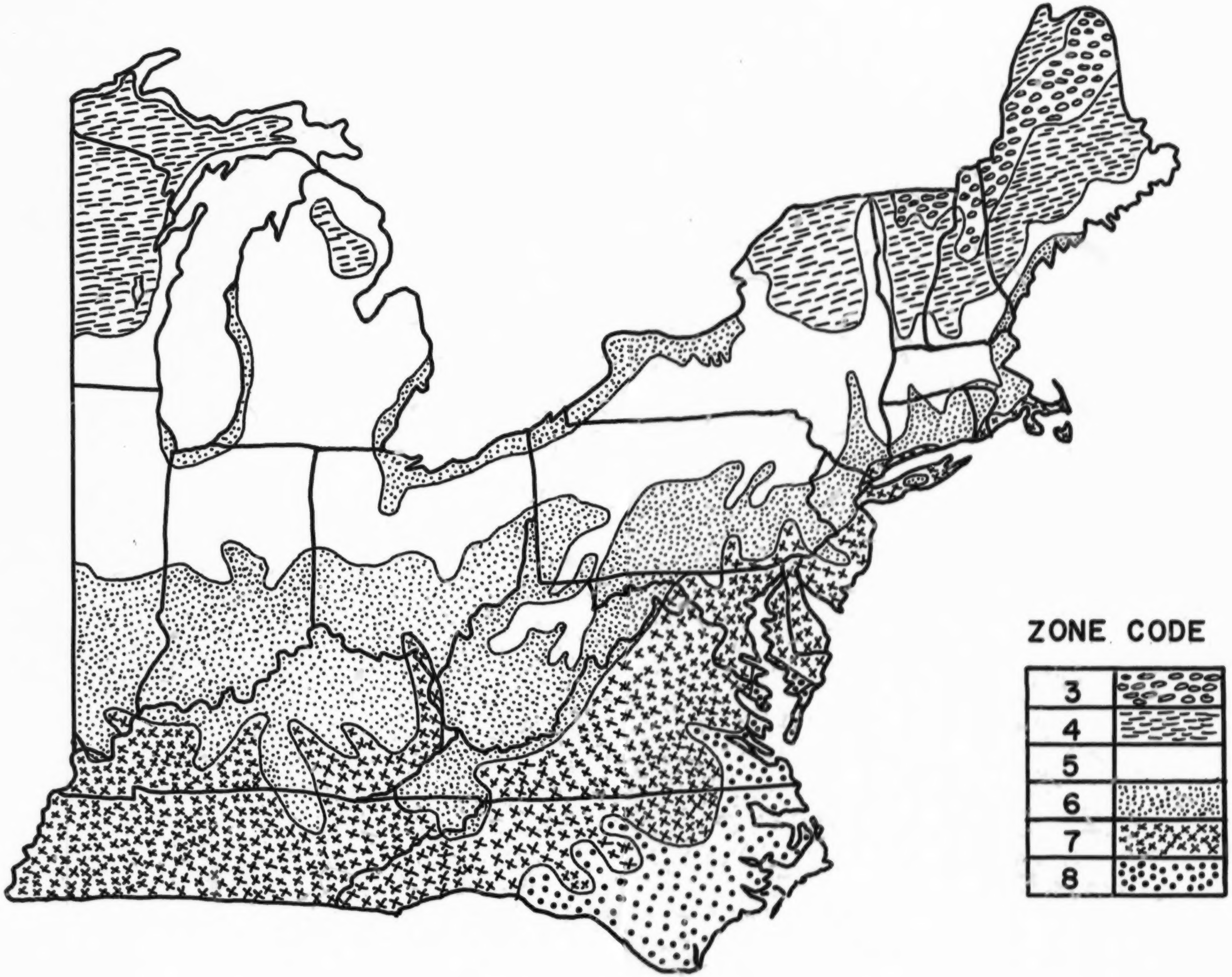
A complete display of plant materials commonly used for landscaping is not feasible in this handbook. It is suggested that the student use the tables of recommended plant materials in this appendix to learn 2 to 5 plants in each category. Also refer to Nursery Production - A Student Handbook, pp. 1-44, Reference No. 21. If available, study the slide series C - "Commonly Used Trees, Shrubs, Ground Covers, and Vines." For a more complete reference, see Wyman's books: Ground Cover Plants, Reference No. 15; Shrubs and Vines for American Gardens, Reference No. 27; and Trees for American Gardens, Reference No. 32.

Tables of recommended trees and shrubs follow. These tables may be used as references for selecting trees and shrubs to fit landscape plans you have prepared or they may be used as a study guide.

Sketches depicting some of the more common shapes of trees and shrubs are shown below. A Hardiness Zone Map also precedes the Tables of Plant Materials. When using the tables, one should know that plants indicated for a particular hardiness zone are also hardy in higher numbered zones, but not in lower numbered zones.



Plant Forms.



Plant Hardiness Zone Map for Certain Northeastern States *

* Adapted from Plant Hardiness Zone Map, Agricultural Research Service, United States Department of Agriculture, Miscellaneous Publication No. 814.

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Standard Deciduous Trees (40-160')

Hardiness Zones	Form	Height	Width	Leaf Size	Fall Color	Name	Comments
3-8	pyramidal when young, round at maturity	60'	50'	med.	brilliant red	Red Maple Acer rubrum	has red flowers which bloom in early April - grows well in low swampy areas
3-8	densely upright growth, pyramidal at maturity	75'	36'	med.	red and yellow	Column Red Maple Acer rubrum 'columnare'	fast growing upright type, good street tree
3-8	rounded	90'	90'	large	yellow	Norway Maple Acer platanoides	dense head, often used as street tree
3-8	rounded	90'	90'	large	red	Norway Maple Acer platanoides 'Crimson King'	deep red leaves all season
3-8	oval when young, rounded head when mature	110'	93'	med.	yellow and orange	Sugar Maple Acer saccharum	beautiful fall color, sap yields maple syrup
3-8	upright, narrow pyramidal head	100'	45'	med.	red and yellow	Pyramid Sugar Maple Acer saccharum 'pyramidale'	similar form to Columnar Red Maple
4-8	densely pyramidal	108'	106'	med.	golden bronze	European Beech Fagus sylvatica	intolerant of compact soils, has glossy, dark green leaves, gray trunk
4-8	densely pyramidal	108'	106'	med.	bronze	Purple Beech Fagus sylvatica 'purpurea'	intolerant of compact soils - purple leaves
4-8	wide-spreading, open	130'	130'	med.	yellow	Ginkgo Ginkgo biloba	picturesque fan-like leaves
4-8	narrow pyramidal	130'	40'	med.	yellow	Sentry Ginkgo Ginkgo biloba 'fastigiata'	good street tree
4-8	broad and open	92'	112'	large	- - -	Thornless Honeylocust Gleditsia triacanthos 'inermis'	thornless and densely branched, light shade

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Standard Deciduous Trees (40-160')

Hardiness Zones	Form	Height	Width	Leaf Size	Fall Color	Name	Comments
4-8	wide-spreading	135'	135'	large	- - -	"Sunburst" Honeylocust *Gleditsia triacanthos 'inermis'*	young foliage yellow, sometimes turns green in summer
4-8	wide-spreading	135'	135'	large	- - -	Moraine Locust *Gleditsia triacanthos 'inermis moraine'*	withstands city conditions well but has dangerous long thorns
4-8	broadly pyramidal	112'	71'	large	scarlet	Sweet Gum *Liquidambar styraciflua*	star-shaped leaves - used often along park-ways
4-8	broadly pyramidal, massive branches	160'	80'	med.	yellow	Tuliptree *Liriodendron tulipifera*	has greenish-yellow, tulip-shaped flowers which bloom in mid-June
4-8	pyramidal with pendulous branches	85'	50'	med.	scarlet to	Black Tupelo *Nyssa sylvatica*	has dense, dark green, lustrous foliage, excellent fall color
4-8	young trees are pyramidal - old trees are round	130'	107'	large	red	Northern Red Oak *Quercus borealis*	most rapid growing of all oaks, dense lustrous foliage make a good avenue tree
4-8	open and round-topped	80'	80'	large	scarlet	Scarlet Oak *Quercus coccinea*	good parkway tree, but difficult to transplant
5-8	young trees are pyramidal - old trees are round, open	96'	85'	med.	yellow to russet	Shingle Oak *Quercus imbricaria*	leaves without lobes, makes good hedges or screens, foliage lustrous dark green
4-8	pyramidal with drooping branches, dense branching	135'	135'	med.	scarlet	Pin Oak *Quercus palustris*	has picturesque growth habit, is easily transplanted, should not be planted near a street
5-8	open, broad head - short trunk	80'	80'	med.	brown	English Oak *Quercus robur*	these trees grow in the famous Sherwood Forest, slow growing, dark green leaves

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Standard Deciduous Trees (40-160')

Hardiness Zones	Form	Height	Width	Leaf Size	Fall Color	Name	Comments
5-8	upright, columnar	80'	30'	med.	brown	Pyramidal English Oak *Quercus robur 'fastigiata'*	of the type grown in the famous Sherwood Forest
7-8	wide spreading	60'	120'	med.	- - -	Live Oak *Quercus virginiana*	evergreen in southern range, very popular, long-lived
4-8	rounded form, long, pendulous branches	40'	60'	med.	- - -	Thurlow Weeping Willow *Salix elegantissima 'thurlow'*	best variety of several available
3-8	densely pyramidal	100'	50'	small	yellow	Little-leaf Linden *Tilia cordata*	fragrant flowers, grows well in cities, dense foliage gives perfect shade

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Deciduous Trees (8-35')

Hardiness Zones	Form	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Name	Comments
6-7	spreading, flat topped	36'	36'	fine	- - -	pink midsummer	Silktree Albizzia julibrissima 'rosea'	long flowering period, soil borne wilt disease in Zone 8
2-8	upright but rounded, branching dense	15'	15'	med.	scarlet	- - -	Amur Maple Acer ginnala	has red fruit in midsummer, extremely hardy, dense growth
5-8	rounded and often mound-like	20'	25'	med.	scarlet	- - -	Japanese Maple Acer palmatum	some have red foliage, needs good soil, sun
5-8	rounded and often mound-like	20'	25'	med.	scarlet	- - -	Bloodleaf Japanese Maple Acer palmatum 'atropurpureum'	hardy, dark red leaves throughout the growing season
4-8	upright, spreading	25'	20'	med.	red	white	Shadblow or Serviceberry Amelanchier canadensis	flowers in early May, edible blue fruit, shade tolerant, gray trunk
2-7	pyramidal, pendulous branches in older trees	35'	15'	med.	yellow	- - -	Cutleaf Weeping Birch Betula pendula 'laciniata'	short life - 25-30 yrs., susceptible to borers, very graceful tree
5-8	pyramidal when young, round at maturity	30'	25'	med.	yellow	- - -	European Hornbeam Carpinus betulus	makes good hedge, very graceful
5-8	upright, becoming vase-shaped	30'	15'	med.	yellow	- - -	Pyramidal European Hornbeam Carpinus betulas 'fastigiata'	- - -
4-8	flat top, irregular	25'	25'	med.	yellow	purplish-pink	Eastern Redbud Cercis canadensis	tiny pea-like flowers appear in mid-May before leaves

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Deciduous Trees (8-35')

Hardiness Zones	Form	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Name	Comments
4-8	horizontal branching	25'	25'	med.	scarlet	bracts are white or pinkish	Flowering Dogwood *Cornus florida*	red berries in fall, large flowers in mid-May, foliage is dense and lustrous
5-8	horizontal branching	20'	20'	med.	scarlet	bracts are white or pinkish	Kousa Dogwood *Cornus kousa*	raspberry-like red berries, large flowers in mid-June, from China
4-8	rounded, dense, shrub-like	20'	20'	med.	red	yellow	Corneliancherry Dogwood *Cornus mas*	has bluish-black berries, small flowers appear before leaves, flowers in early April
4-7	branches spreading round-headed, dense	20'	20'	small	- - -	bright-scarlet	Paul's Scarlet English Hawthorn *Crataegus oxyacantha 'pauli'*	scarlet colored fruit in the fall, flowers are double
4-7	broadly columnar, dense branching, eventually has round head	20'	20'	med.	scarlet to orange	white	Washington Hawthorn *Crataegus phaenopyrum*	interesting year-round, fruit is bright red and effective all winter
2-8	wide spreading, open	25'	30'	med.	- - -	silvery outside, yellow inside	Russian Olive *Elaeagnus angustifolia*	interesting foliage and fragrant flowers in early June, crooked trunk
6-8	pyramidal habit	30'	15'	large	orange to red	white	Franklinia *Franklinia alatamaha*	3" blooms in Sept.-Oct., brilliant fall foliage
5-8	flat-topped	25'	35'	med.	- - -	yellow	Goldraintree *Koelreuteria paniculata*	has yellow fruit in fall, wide range of soils, flowers in early summer

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Deciduous Trees (8-35')

Hardiness Zones	Form	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Name	Comments
5-8	stiffly upright	30'	15'	med.	- - -	yellow - pendulous clusters - May	Laburnum Laburnum vossi	unusual
4-8	pyramidal when young, massive when mature	35'	20'	med.	- - -	white	Kobus Magnolia Magnolia kobus	large white blooms in May, slow growing
5-8	shrub-like with many stems	20'	20'	med.	- - -	white to purple	Saucer Magnolia Magnolia soulangeana	large flowers precede leaves, flowers in April, course textured leaves
5-8	branching dense, mounded to shrub-like	20'	20'	med.	bronze to yellow	white	Star Magnolia Magnolia stellata	large flowers in mid-April, has interesting red fruit, dark green foliage
5-8	grows as a tree in south, as a shrub in north	25'	20'	med.	- - -	cream	Sweetbay Magnolia Magnolia virginiana	flowers over long period, tolerant of wet soils, has red seed pods in fall
4-8	rounded	20'	25'	med.	- - -	red buds, white flowers	Arnold Crabapple Malus arnoldiana	heavy flowering in May, yellow and red fruit, 5/8" in diameter
4-8	mounded, almost shrub-like, dense	20'	20'	med.	- - -	rich carmine	Carmine Crabapple Malus atrosanguinea	flowers in mid-May, dark green, dense foliage
4-8	rounded, densely branched	20'	20'	med.	- - -	crimson	Dorthea Crabapple Malus dorothea	semi-double flowers, blooms every year
4-8	rounded and densely branched	20'	20'	med.	- - -	pink but fades to white	Japanese Flowering Crabapple Malus floribunda	blooms in early May, fruits yellow and red from August to October
5-8	upright, almost vase-shaped, dense	15'	15'	med.	- - -	neyron rose	Hall's Parkman Crabapple Malus halliana 'parkmani'	foliage is dark glossy green, blooms in early May, fruit is dull red

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Deciduous Trees (8-35')

Hardiness Zones	Form	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Name	Comments
4-8	upright	21'	12'	med.	- - -	white	Hopa Crabapple *Malus hopa*	flowers in May, red fruit
2-8	round-headed, open	15'	15'	med.	- - -	pink	Bechtel Crabapple *Malus ioensis* '*plena*'	flowers in late May
4-8	rounded	20'	20'	med.	- - -	red	Eley Purple Crabapple *Malus purpurea* '*eleyi*'	dark flowers in May, fruit deep purple
5-8	mounded, dense branching	8'	12'	med.	- - -	pure white	Sargent Crabapple *Malus sargenti*	flowers in mid-May, fruit is dark red, smallest Crabapple
4-8	upright	20'	15'	med.	- - -	pale pink	Scheidecker Crabapple *Malus scheideckeri*	resistant to apple scab, dense foliage
3-7	upright, rounded	25'	25'	med.	purple	pink	"Pink Cloud" Pissard Plum *Prunus cerasifera* '*rosea*'	red-purple leaves all season, bright pink flowers in April
5-7	rounded, dense branching	30'	30'	med.	- - -	light pink	Higan Cherry *Prunus subhirtella*	flowers in late April
5-7	pendulous branches	20'	20'	med.	- - -	pale pink	Weeping Higan Cherry *Prunus subhirtella* '*pendula*'	most popular of the Higan Cherries
5-7	flat-topped	20'	20'	med.	- - -	pink	Kwazan Cherry *Prunus serrulata*	double-flowered, blooms last a long time
5-7	flat-topped, bushy	35'	35'	med.	- - -	white to pink	Yoshina Cherry *Prunus yedoensis*	should be planted 30 - 40 ft. apart, flowers in late April
2-8	erect while young, spreading and open at maturity	20'	20'	med.	reddish	white	European Mountain Ash *Sorbus aucuparia*	susceptible to borers, fruit bright orange or red clusters, flowers in late May

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Evergreen Trees

Hardiness Zones	Form	Height	Width	Leaf Size	Foliage Color	Soil	Exposure	Name	Comments
4-8	pyramidal, narrow horizontal branching	75'	12'	2"	bluish green	tolerant	sun	White Fir Abies concolor	needle-like leaves, withstands heat and drought better than most firs
5-8	narrow to broadly pyramidal	120'	60'	needle-like	dark green	- - -	sun	Cedar of Lebanon Cedrus libani	very popular where hardy
3-8	slender to broadly pyramidal	150'	40'	scale-like	blue-green	wet	sun	Sawara False-cypress Chamaecyparis pisifera	leaves are scale-like, many horticultural forms
5-8	narrowly pyramidal	150'	30'	needle-like	bluish green	tolerant	sun	Cryptomeria Cryptomeria japonica	plume-like branchlets, orange bark, easily grown
5-8	pyramidal	45'	17'	2"	dark green	well drained	sun	American Holly Ilex opaca	spiny leaves, brilliant fruit, sexes separate, outstanding ornamental
2-8	pyramidal, dense	20'-90'	12'	scale-like	green	tolerant	sun	Red Cedar Juniperus virginiana	grows slowly, several excellent forms including 'burki,' 'canaenti,' 'glauca,' 'pyramidalis,' and others
7-8	pyramidal, broad-leaves, large white blooms	90'	40'	5"-6"	glossy, dark green	- - -	sun	Southern Magnolia Magnolia grandiflora	outstanding and popular where hardy
2-8	pyramidal, pendulous branchlets	150'	35'	1"	dark green	- - -	sun	Norway Spruce Picea abies	does not mature gracefully - becomes thin at top

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Evergreen Trees

Hardiness Zones	Form	Height	Width	Leaf Size	Foliage Color	Soil	Exposure	Name	Comments
4-8	densely pyramidal, pendulous branching	90'	20'	needle-like	dark green	- - -	sun	Serbian Spruce *Picea omorika*	needles flat, white undersurface; the best spruce
2-8	nearly columnar, dense	50'	15'	2"	bluish white	- - -	sun	Koster Blue Spruce *Picea pungens 'kosteriana'*	very popular, very susceptible to spruce gall aphids, old trees lose lower branches
4-8	densely pyramidal, wide spreading	90'	50'	3"-6"	dark green glossy	- - -	sun	Austrian Pine *Pinus nigra*	fast growing, makes good specimen plant
2-8	stout spreading branches forming pyramidal head	50'	50'	4"-6"	dark green lustrous	tolerant	sun	Red Pine *Pinus resinosa*	bark is reddish
3-8	rounded or pyramidal	100'	60'	2"-5"	soft green	- - -	sun	White Pine *Pinus strobus*	has delicate, graceful foliage
2-8	pyramidal when young, round-topped, irregular when old	75'	30'	2"-3"	bluish green	- - -	sun	Scotch Pine *Pinus sylvestris*	reddish trunk, picturesque when old
7-8	broadly pyramidal	60'	30'	4"	dark green	- - -	sun	Yew Podocarpus *Podocarpus macrophyllus*	similar to Taxus, but larger needles; popular hedge plant
4-8	densely pyramidal, branching, horizontal	75'	20'	needle-like	bluish green	- - -	sun	Douglas Fir *Pseudotsuga taxifolia*	often used as Christmas trees, soft needles
3-8	long, slender, horizontal or drooping	75'	50'	needle-like	dark green	- - -	light shade	Canada Hemlock *Tsuga canadensis*	dense foliage, very graceful trees, may be sheared for large hedge

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Large Deciduous Shrubs (8-30')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
4-8	24'	18'	med.	red	yellow	red	- - -	sun or filtered sun	Cornelian Cherry *Cornus mas*	rounded to upright form, small but very early flowers
5-8	15'	10'	large	yellow to orange	purplish	- - -	- - -	sun	Smoke Tree *Cotinus coggyria*	upright habit
3-8	20'	10'	med.	reddish	- - -	brilliant pink	- - -	sun or filtered sun	Aldenham Spindle Tree *Euonymus europaeus 'aldenhamensis'*	upright, interesting fruit
5-8	30'	15'	large	yellow	yellow	- - -	- - -	sun	Chinese Witch-hazel *Hamamelis mollis*	rounded form
5-8	15'	10'	med.	- - -	white, pink, red, and blue	- - -	normal	sun	Shrub Althea *Hibiscus syriacus*	upright form, August flowering
4-8	12'	8'	med.	- - -	pink	- - -	tolerant	sun	Beauty Bush *Kolkwitzia amabilis*	upright, arching branches, profuse flowering
7-8	12-24'	6-12'	med.	- - -	white, pink, red, lavender	- - -	tolerant	sun	Common Crapemyrtle *Lagerstroemia indica*	upright, open form, August flowering, very popular
3-8	15'	12'	med.	- - -	white	black	tolerant	sun	Amur Privet *Ligustrum amurense*	hardier then California Privet, upright, dense
4-8	15'	12'	med.	- - -	white	black	tolerant	sun	European Privet *Ligustrum vulgare*	rounded-loose form, fragrant flowers, often used as hedges
2-8	15'	15'	med.	- - -	white - changing yellowish	red	tolerant	sun	Amur Honeysuckle *Lonicera maacki*	flowers in late May, fruit and leaves may remain until Thanksgiving, rounded form

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Large Deciduous Shrubs (8-30')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
3-8	15'	15'	med.	- - -	pink to white	red	tolerant	sun	Tatarian Honeysuckle *Lonicera tatarica*	rounded form, can be planted at the seashore, very popular
5-8	15-30'	10'	large	- - -	white	dark red	- - -	- - -	Sweetbay Magnolia *Magnolia virginiana*	fragrant flowers in late May, evergreen in southeast, upright habit, tree in south
5-8	15'	10'	med.	- - -	purple	- - -	tolerant	sun	Chinese Lilac *Syringa chinensis*	upright form, flowers in mid-May
3-8	12'	8'	med.	red	white	blue	acid	sun	Highbush Blueberry *Vaccinium corymbosum*	rounded form
3-8	15'	8'	med.	red	white	red to black	wet tolerant	sun or filtered sun	Wayfaring Tree Viburnum *Viburnum lantana*	flowers in early June; grows rapidly, upright
2-8	20'	20'	large	purplish red	white	black, purplish red	dry tolerant	sun	Nannyberry Viburnum *Viburnum lentago*	rounded form, excellent fall color; good screen or border plant
3-8	15'	15'	med.	shining red	white	blue, black	tolerant	sun	Blackhaw Viburnum *Viburnum prunifolium*	rounded form, excellent as a specimen or for massing
5-8	12'	12'	med.	- - -	white	black	tolerant	sun	Burkwood Viburnum *Viburnum burkwoodi*	fragrant flowers, somewhat open plant form
4-8	15'	15'	med.	red	silver	red	toler-	sun	Sargent Cranberrybush Viburnum *Viburnum sargenti*	rounded form

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Large Deciduous Shrubs (8-30')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
5-8	12'	12'	large	- - -	white	orange	tolerant	sun	Tea Viburnum *Viburnum setigerum*	rounded form, flowers in early July
4-8	25'	25'	large	red	white, red	red	tolerant	sun	Siebold Viburnum *Viburnum sieboldi*	rounded form, flowers in late May, dark green leaves, outstanding as specimen plant
2-8	12'	12'	large	red	white	scarlet	wet	sun	American Cranberrybush Viburnum *Viburnum trilobum*	flowers in late May, edible fruit

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Narrowleaf Evergreen Shrubs (to 15")

Hardi-ness Zones	Form	Height	Leaf Size	Color	Name	Comments
3-8	compact pyramidal branches slightly pendulous	10'	scale-like	glossy green	Slender Hinoki Falsecypress *Chamaecyparis obtusa 'gracilis'*	leaves are scale-like, like cypress
4-8	broad, flat-topped, pyramidal	10'	feather-like	- - -	Pfitzer Juniper *Juniperus chinensis 'pfitzeriana'*	leaves - light, feathery texture
4-8	low, creeping growth	1½'	needle-like	steel blue	Sargent Juniper *Juniperus chinensis 'sargenti'*	often grown in seashore areas
2-8	low, spreading growth	2'	feather-like	light green - purple in fall	Andorra Juniper *Juniperus horizontalis 'plumosa'*	- - -
4-8	wide spreading	6'	needle-like	bright blue	Meyer's Juniper *Juniperus squamata 'meyeri'*	vigorous
4-8	shape varies with variety - some global others prostrate	6'	needle-like	- - -	Mugho Pine *Pinus mugo 'mughus'*	susceptible to scale
6-8	varies with variety - most are upright	3'	needle-like	- - -	Spreading English Yew *Taxus baccata 'repandens'*	over 30 varieties have been listed, has red berries in fall
4-8	varies with variety	10'	needle-like	- - -	Spreading Japanese Yew *Taxus cuspidata*	one of the best narrowleaf evergreens, has red berries in fall
4-8	pyramidal form, horizontal branches	20'	- - -	- - -	Upright Japanese Yew *Taxus cuspidata 'capitata'*	- - -
4-8	shrub-like growth, spreading branches	3'	needle-like	dull green	Dwarf Japanese Yew *Taxus cuspidata 'nana'*	leaves are shorter and more dull than the species
4-8	pyramidal with upright branches	10'	needle-like	- - -	Hatfield Yew *Taxus media 'hatfieldi'*	very popular variety

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Narrowleaf Evergreen Shrubs (to 15")

Hardiness Zones	Form	Height	Leaf Size	Color	Name	Comments
4-8	columnar	12'	needle-like	- - -	Hick's Yew *Taxus media 'hicksi'*	excellent for formal accent
2-8	usually conical in shape	15'	scale-like	- - -	Ware's Arborvitae *Thuja occidentalis 'wareana'*	valued for its fan-like branches rapid growth

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Large Broadleaf Evergreen Shrubs (12-30')

Hardiness Zones	Height	Leaf Size	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
7-8	15'	large (7")	- - -	red	- - -	requires shade	Japanese Aucuba Aucuba japonica	rounded form, dark green glossy leaves, variegated type is popular
5-8	15'	small	- - -	- - -	tolerant	- - -	Common Box Buxus sempervirens	rounded, often used as hedge or specimen plant
7-8	20'	large (4")	white to red	- - -	good	shade tolerant	Common Camellia Camellia japonica	pyramidal
7-8	20'	large (4")	white to red	- - -	good	shade tolerant	Sasanqua Camellia Camellia sasanqua	pyramidal, early flowering
8	15'	med.	- - -	red	- - -	- - -	Evergreen Euonymus Euonymus japonicus	upright to rounded form, excellent as hedge
5-8	20'	med.	- - -	red	good, well-drained	- - -	American Holly Ilex opaca	pyramidal with spiny leaves, slow growing, becomes tree in southern range
6-8	20'	large (4")	- - -	black	- - -	sun	Sweetbay Laurel Laurel nobilis	pyramidal, often sheared
6-7	18'	large (4-6")	white	black	- - -	sun	Common Laurel Cherry Prunus laurocerasus	rounded, popular for hedges
3-8	15'	large	rose to purplish-pink	- - -	- - -	requires partial shade	Rose Bay Rhododendron Rhododendron maximum	rounded, irregular form, large dark green leaves
7-8	30'	large (8")	white	red	well-drained	sun	Chinese Photinia Photinia serrutata	vigorous shrub, brilliant red young leaves, leggy unless occasionally pruned
5-8	12'	large (4-6")	white	red to black	- - -	sun	Leatherleaf Viburnum Viburnum rhytidophyllum	upright, evergreen in south

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Medium Deciduous Shrubs (6-10')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
4-8	9'	9'	med.	- - -	- - -	- - -	tolerant	sun or shade	Acanthopanax *Acanthopanax sieboldianus*	very tolerant of shade and polluted air
5-8	7'	7'	small	- - -	yellow	red	tolerant	sun	Mentor Barberry *Berberis mentorensis*	rounded form, thorny, semi-evergreen
5-8	7'	7'	small	scarlet	yellow	dk. red	tolerant	sun	Japanese Barberry *Berberis thunbergi* (*B. t.'purpurea'* has red leaves)	rounded or columnar forms, colorful fruit and autumn foliage
4-8	6'	8'	med.	- - -	white to red	green	tolerant	sun	Flowering Quince *Chaenomeles lagenaria*	rounded form, many varieties
2-8	7'	7'	med.	reddish	white	white	moist	sun	Red Osier Dogwood *Cornus stolonifera*	loose-rounded, valued for its highly colored red winter twigs; there is a yellow-twigged form
5-8	6'	10'	small	dull red	pink	red	tolerant	sun	Spreading Cotoneaster *Cotoneaster divaricata*	arching spreading growth, semi-evergreen, bright red berries
4-8	9'	9'	small	- - -	pinkish	black	tolerant	sun	Hedge Cotoneaster *Cotoneaster lucida*	dense, rounded form, lustrous green foliage, susceptible to fire blight
5-8	8'	8'	med.	- - -	white	- - -	tolerant	sun	Snow-flake Deutzia *Deutzia scabra 'candidissima'*	arching form, flowers in late June
3-8	10'	10'	med.	scarlet	- - -	scarlet	tolerant	sun	Winged Euonymus *Euonymus alata*	rounded form, of particular interest because of winged horizontal branches

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Medium Deciduous Shrubs (6-10')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
5-8	9'	9'	med.	- - -	deep yellow	- - -	tolerant	sun	Forsythia, "Lynwood Gold," "Spring Glory," "Beatrix Farrand" Forsythia intermedia 'spectabilis'	upright growth, yellow flowers in mid-April
4-8	10'	10'	large	yellow	yellow	- - -	wet	sun or filtered sun	Vernal Witch-hazel Hamamelis vernalis	open, spreading form, blooms very early--sometimes January or February
6-8	8'	6'	large	- - -	blue or pink	- - -	good	sun	French Hydrangea Hydrangea macrophylla 'hortensia'	rounded form, 6-10" round flower heads in August
3-8	9'	9'	med.	yellow	- - -	bright red	any good soil	sun or filtered sun	Winterberry Holly Ilex verticillata	berries remain to January
5-8	7' (3-10')	3-10'	small	- - -	bright yellow	- - -	tolerant	sun	Winter Jasmine Jasminum nudiflorum	rounded habit, pendulous branches, needs frequent pruning, early April flowering
4-8	5'	5'	med.	- - -	yellow	- - -	tolerant	sun	Kerria Kerria japonica 'pleniflora'	upright branches, ball-shapped flowers in mid-May, has green twigs all winter, much dead wood
4-8	10'	10'	med.	reddish	pink	brown	tolerant	sun	Beauty-bush Kolkwitzia amabilis	ornamental in spring, summer and winter; upright, arching
3-8	6'	6'	med.	russet purplish	white	black	tolerant	sun	Regel Privet Ligustrum obtusifolium 'regelianum'	branches almost horizontal, rounded form

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Medium Deciduous Shrubs (6-10')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
5-8	8'	8'	med.	- - -	white	red	tolerant	sun	Winter Honeysuckle Lonicera fragrantissima	rounded form, stiff, leathery, half evergreen leaves, fragrant flowers in March
5-8	10'	10'	med.	blue to gray-green	rose	red	tolerant	sun or filtered sun	Blueleaf Honeysuckle Lonicera korolkowi	rounded form, outstanding chiefly for its blue to gray-green foliage color
2-8	9'	9'	med.	- - -	- - -	gray	sandy soils	sun or filtered sun	Northern Bayberry Myrica pennsylvanica	upright, loose form, aromatic semi-evergreen leaves
5-8	6'	6'	med.	- - -	white	- - -	tolerant	sun	Avalanche Mockorange Philadelphus lemoine 'avalanche'	upright habit, splendid arching branches, fragrant flowers
5-8	6'	6'	med.	- - -	white	- - -	tolerant	sun	Albatre Mockorange Philadelphus virginalis 'albatre'	arching branches, fragrant, double flowers
5-8	9'	9'	med.	- - -	white	- - -	tolerant	sun	Virginal Mockorange Philadelphus virginalis 'virginal'	poor specimen plant; it is devoid of lower branches
5-8	9'	8'	large	yellow	yellow, orange, scarlet	- - -	acid, moist	sun or filtered sun	Flame Azalea Rhododendron calendulaceum	upright habit, very colorful flowers in early June
4-8	6'	6'	med.	yellow to crimson	pale rosy-purple	- - -	acid, moist	sun or filtered sun	Korean Rhodendron Rhodendron mucronulatum	upright, blooms in mid-April
4-8	10'	10'	large	yellow, orange, crimson	rose pink	- - -	acid, moist	filtered sun	Royal Azalea Rhododendron schlippenbachi	rounded habit, large flowers and colorful autumn foliage
5-8	6'	6'	med.	- - -	white	black	tolerant	sun or filtered	Jetbead Rhodotypos scandens	rounded habit, interesting because black berries remain in winter

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Medium Deciduous Shrubs (6-10')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
5-8	7'	7'	small	- - -	canary yellow	dark scarlet	tolerant	sun	Father Hugo Rose *Rosa hugonis*	rounded, arching habit, blooms in late May
2-8	5'	5'	med.	orange	pink to white	brick red	tolerant	sun	Rugosa Rose *Rosa rugosa*	upright, vigorous grows well on seashore, several varieties available
4-8	7'	7'	med.	red to orange	white	- - -	tolerant	sun	Bridalwreath Spirea *Spiraea prunifolia* '*plena*'	arching habit, numerous very small flowers, blooms in mid-May
4-8	7'	7'	med.	orange to red	pure white	brown	tolerant	sun	Van Houtte Spirea *Spiraea vanheuttei*	profuse white flower clusters, arching habit, twiggy, untidy seed heads
3-8	6'	6'	small	- - -	pink	white	tolerant	sun	Snowberry *Symphoricarpos albus* '*laevigatus*'	upright, arching, white berries in fall
5-8	6'	6'	med.	- - -	lilac	- - -	tolerant	sun	Persian Lilac *Syringa persica*	flowering - heavy, upright, rounded form
5-8	9'	9'	med.	russet red	white	bright red	tolerant	sun	Linden Viburnum *Viburnum dilatatum*	rounded form, flowers are clustered, flowers in early June, dense compact growth
4-8	10'	10'	med.	- - -	white	- - -	tolerant	sun	Japanese Snowball *Viburnum tomentosum* '*sterile*'	horizontal branches, heavy flowering in May
4-8	5'	5'	med.	reddish	white or pink	black	tolerant	sun	Koreanspice Viburnum *Viburnum carlesi*	dense rounded form, flowers in mid-May, flowers are clustered; susceptible to graft disease

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Medium Broadleaf Evergreen Shrubs (6-12')

Hardiness Zones	Height	Width	Leaf Size	Flower Color & Time	Fruit Color	Soil	Exposure	Name	Form and Comments
7-8	6-10'	6'	7"	- - -	bright red	- - -	shade	Japanese Aucuba Aucuba japonica	rounded form, dioecious
5-8	6'	6'	3" med.	yellow mid-May	bluish black	- - -	shade tolerant	Wintergreen Barberry Berberis julianae	rounded form year-round interest, dense growing - hardiest evergreen barberry
7-8	12'	12'	2-4"	silvery white	red berries	tolerant	sun	Thorny Eleagnus Eleagnus pungens	rounded form, very fragrant flowers, popular plant
8	12'	- - -	1-3"	- - -	pink to orange	- - -	- - -	Evergreen Euonymus Euonymus japonica	rounded - upright, widely used
6-8	8'	8'	2-3" med.	- - -	pinkish to red	- - -	- - -	Spreading Euonymus Euonymus kiautschovica	rounded form, widely used
7-8	9'	9'	3"	- - -	bright red	tolerant	sun	Burford Chinese Holly Ilex cornuta 'burfordi'	rounded habit, shiny leaves with spines, fruit well retained
6-8	8'	16'	small	- - -	black	- - -	- - -	Convex Japanese Holly Ilex crenata 'convexa'	often twice as broad as high, dense, broad spreading
5-8	10'	8'	5" large	pink and white - mid-June	- - -	requires acid soil	- - -	Mountainlaurel Kalmia latifolia	rounded form, often used in foundation planting
7-8	9-18'	6'	4"	white - mid-July	black	- - -	- - -	Japanese Privet Ligustrum japonica	rounded, often used as a hedge
7-8	8'	8'	- - -	white - late July	bright red	tolerant	sun	Nandina Nandina domesticum	upright habit, none-branching stems, bright red leaves in fall
6-8	7'	4'	3½" large	white - mid-April	- - -	requires acid soil	full sun to semi-shade	Japanese Pieris Pieris japonica	flowers in pendulous clusters to 5" long, lustrous dark green foliage, dense, upright

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Medium Broadleaf Evergreen Shrubs (6-12')

Hardiness Zones	Height	Width	Leaf Size	Flower Color & Time	Fruit Color	Soil	Exposure	Name	Form and Comments
5-7	18'	9'	4-6"	white - late May	black	- - -	- - -	Cherry Laurel Prunus laurocerasus 'schipkaensis'	rounded, often used as a hedge
6-8	7'	8'	1½"	white	bright red berries	tolerant	sun	Laland Firethorn Pyracantha coccinea 'lalandi'	berries provide vivid winter color - difficult to transplant, rounded form
5-8	8'	8'	large up to 6"	light pink	red to black	rich - well-drained	semi-shade	Leatherleaf Viburnum Viburnum rhytidophyllum	rounded form, dioecious, interesting foliage upright habit

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Deciduous Shrubs (to 5')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
5-8	4'	4'	small	scarlet	yellow, reddish outside	bright red	tolerant	sun	Purple Box Barberry Berberis thunbergi 'minor'	rounded form, purple leaves
4-8	3'	4'	med.	- - -	red	green	tolerant	sun	Japanese Quince Chaenameles japonica	spreading form, May flowering, low, dense
4-8	3'	5'	small	reddish	pinkish	red	tolerant	sun	Rock Cotoneaster Cotoneaster horizontalis	mid-June flowering, flat horizontal branches, semi-evergreen
4-8	4'	4'	med.	- - -	white	- - -	tolerant	sun	Slender Deutzia Deutizia gracilis	late May-flowering, dense, compact, arching branches
3-8	5'	5'	med.	scarlet	- - -	scarlet	- - -	sun	Dwarf Winged Euonymus Euonymus alata 'compactu'	rounded form, horizontal branches, provides excellent fall color
4-8	3'	3'	large	- - -	white, ball-shaped clusters	- - -	tolerant	sun	Hills of Snow Hydrangea arborescens 'grandiflora'	rounded, compact plant, conspicuous flowers, popular
5-8	5'	5'	very large	reddish	white	- - -	tolerant	sun or filtered sun	Oak-leaved Hydrangea Hydrangea guercifolia	irregular, dense mid-July flowering
4-8	3'	3'	small	- - -	bright yellow	- - -	tolerant	sun	Shrubby St. Johnsworth Hypericum prolificum	dense, mounded growth, covered with continuous blooms for several weeks at a time
5-8	5'	5'	large	- - -	white, yellow, pink, red, lavender	- - -	good - well-drained	sun, no wind	Tree Peony Paeonia suffruticosa	rounded habit, very large silky flowers

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Deciduous Shrubs (to 5')

Hardiness Zones	Height	Width	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
2-8	4'	4'	small	- - -	yellow	- - -	tolerant	sun	Bush Cinquefoil *Potentilla fruticosa*	rounded form, some flower all summer
4-8	4'	4'	med.	- - -	pink, double	- - -	good	sun	Dwarf Flowering Almond *Prunus glandulosa*	rounded - loose form, grown for flowers
5	5'	5'	med.	- - -	yellow, orange, red	- - -	acid	filtered sun	Mollis Azalea *Rhododendron hybrid*	upright habit, outstanding flowers in May
2-8	3'	3'	small	- - -	- - -	- - -	tolerant	sun	Arctic Willow *Salix purpurea* '*nana*'	dense rounded form, excellent as a hedge, blue-gray foliage
5-8	2'	2'	med.	- - -	pink	- - -	tolerant	sun	Bumalda Spirea *Spirea bumalda* '*Anthony Waterer*'	rounded plant, profuse flowering in late June
3-8	2'	2'	med.	red	- - -	- - -	tolerant	sun or light shade	Dwarf European Cranberrybush *Viburnum opulus* '*nanum*'	rounded form, excellent as low hedge
4-8	5'	5'	med.	- - -	red	- - -	tolerant	sun	Weigela *Weigela* '*Bristol Ruby*'	irregular form, flowers in May and mid-summer

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Broadleaf Evergreen Shrubs (to 6')

Hardiness Zones	Height	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
5-8	3-5'	1½"	- - -	pink	- - -	- - -	- - -	Glossy Abelia Abelia grandiflora	rounded form, glossy, nearly evergreen leaves, small blooms in clusters - June to frost
5-8	6'	3"	- - -	yellow	blue-black	- - -	- - -	Wintergreen Barberry Berberis julianae	dense, rounded form
5-8	5'	2"	- - -	white - tinged with red	blue-black	- - -	- - -	Three Spine Barberry Berberis triacanthophora	one of the most hardy Berberries, upright, evergreen
5-8	4'	1"	bronze	golden yellow	violet-black	- - -	- - -	Warty Barberry Berberis verruculosa	neat, compact growth; interesting leathery foliage, rounded form
5-8	4'	1"	- - -	- - -	- - -	- - -	- - -	Korean Littleleaf Box Buxus microphylla 'koreana'	most hardy of the species; grown for compact, dense, rounded form
5-8	5'	2"	- - -	yellow	- - -	tolerant	sun	Warminster Broom Cytisus praecox	rounded - loose habit, prolific flowering
4-8	6"	1"	- - -	pink	- - -	alkaline, well-drained	sun	Rose Daphne Daphne cneorum	dense, compact form, to 24" wide, abundant fragrant flowers in May
5-8	5'	1"	- - -	pink	- - -	alkaline, well-drained	sun	Somerset Daphne Daphne 'somerset'	upright habit (4' wide) abundant pink flowers in May-June

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Broadleaf Evergreen Shrubs (to 6')

Hardiness Zones	Height	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
5-8	4'	1-2"	- - -	- - -	orange	- - -	- - -	Bigleaf Wintercreeper Euonymus Euonymus fortunei 'vegetus'	rounded form, also thick leathery leaves
5-8	12"	1"	- - -	white	- - -	well-drained	sun or light shade	Evergreen Candytuft Iberis sempervirens	rounded form, abundant flowers in May
6-8	4'	3/4"	- - -	- - -	black	- - -	- - -	Convexleaf Holly Ilex crenata 'convexa'	rounded form, lustrous dark-green foliage
4-8	3-6'	7"	bronze	white, drooping	- - -	acid	light shade	Drooping Leucothoe Leucothoe catesbaei	rounded form, drooping branches, best in border plantings
7-8	6'	1/2"	- - -	white	blue-purple	tolerant	sun	Box Honeysuckle Lonicera nitida	rounded habit, compact, often used as hedges
5-8	4'	- - -	bronze to purplish	bright yellow	bluish-black	- - -	light shade	Oregongrape Mahonia Mahonia aquifolia	rounded-irregular form, holly-like lustrous leaves, flowers in early May
4-8	6'	3½"	- - -	white	- - -	tolerant	light shade	Mountain Pieris Pieris floribunda	upright, dense form, flowers in late April
5-8	5'	3"	- - -	pale rosy purple	- - -	acid	light shade	Carolina Rhododendron Rhododendron carolinianum	very interesting flowers and foliage, rounded form
4-8	6'	5"	- - -	lilac-purple	- - -	acid	light shade	Catawba Rhododendron Rhododendron catawbiense	spreading, flowers appear in early June

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Small Broadleaf Evergreen Shrubs (to 6')

Hardiness Zones	Height	Leaf Size	Fall Leaf Color	Flower Color	Fruit Color	Soil	Exposure	Name	Form and Comments
5-8	6'	- - -	- - -	vary widely	- - -	slightly acid	partial shade	Hybrid Azaleas *Rhododendron hybrids*	rounded form, brilliant colors; vary in degree of hardiness
4-8	6'	5"	- - -	white, pink rose, red, lavender, purple	- - -	acid	light shade	Hybrid Rhododendrons *Rhododendron hybrids*	rounded form, slow growing - eventually large shrubs
6-8	3'	- - -	- - -	white	- - -	slightly acid	partial shade	Snow Azalea *Rhododendron mucronatum*	densely branching, hardy below Long Island
6-8	3'	3/4"	reddish	rich magneta	- - -	slightly acid	partial shade	Amoena Azalea *Rhododendron obtusa* '*amoena*'	rounded form, nearly deciduous in New England flowers in mid-May
6-8	4'	3/4"	reddish	salmon to brick-red	- - -	slightly acid	partial shade	Torch Azalea *Rhododendron obtusa* '*kaempferi*'	upright habit, brilliant flowers in May, nearly evergreen
5-8	4'	- - -	- - -	petunia purple	- - -	slightly acid	partial shade	Korean Yodogawa Azalea *Rhododendron yedoensis* '*poukhanensis*'	like the species except more compact, rounded form
7-8	3'	3-4"	- - -	- - -	red	- - -	- - -	Fragrant Sarcococca *Sarcococca ruscifolia*	upright habit, dark lustrous foliage
7-8	1½'	4"	- - -	white	bright red	tolerant	shade *only*	Reeves Skimmia *Skimmia reevesiana*	rounded, compact, sexes separate, popular

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Deciduous and Evergreen Vines

Hardiness Zones	Height	Type	Leaf Size	Fall Leaf Color	Flower Color	Soil	Exposure	Name	Comments
(D) 4-8	35'	twining	med.	- - -	purple	tolerant	sun or shade	Five-leaf Akebia Akebia quinata	semi-evergreen, rapid growing
(D) 4-8	25'	tendrils	med.	- - -	- - -	tolerant	sun	Porcelain Ampelopsis Ampelopsis brevipedumculata 'maximowiczi'	colorful berries change from pale lilac to yellow to blue
(E) 6-8	60'	tendrils	large	- - -	orange-red	tolerant	sun	Cross Vine Bignonia capreolata	profuse flowering, good screen
(D) 4-8	30'	clinging vine	large	- - -	orange to scarlet	tolerant	sun	Trumpet Creeper Campsis tagliabuana 'Madame Galen'	large flowers in mid-July, needs some support
(D) 2-8	20'	twining	med.	yellow	- - -	tolerant	sun	American Bittersweet Celastrus scandens	red and orange berries on female plants in fall and winter
(D) 5-8	20'	tendrils	med.	- - -	various	alkaline	light	Clematis Clematis hybrids	large white, pink, lavender, purple blooms
(D) 5-8	30'	tendrils	med.	- - -	white	tolerant	sun	Sweet Autumn Clematis Clematis paniculata	abundant flowers in August, plumy seed heads in fall, dense lustrous leaves
(E) 5-8	25'	clinging vine	med.	- - -	- - -	tolerant	sun or shade	Bigleaf Wintercreeper Euonymus fortunei 'vegetus'	one of several forms of E. fortunei that are very useful; all subject to scale which may be difficult to control

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Deciduous and Evergreen Vines

Hardiness Zones	Height	Type	Leaf Size	Fall Leaf Color	Flower Color	Soil	Exposure	Name	Comments
(E) 7-8	12'	clinging vine	large	- - -	- - -	tolerant	sun or shade	Algerian Ivy Hedera canariensis	"Canary Queen" a popular variegated form
(E) 5-8	90'	clinging vine	large	- - -	- - -	tolerant	sun or shade	English Ivy Hedera helix 'Baltic'	excellent in north and south, there are numerous forms, all less hardy than "Baltic." Old plants have green flowers and black fruits
(D) 4	75'	clinging vine	large	- - -	white	tolerant	light shade	Climbing Hydrangea Hydrangea petiolaris	large flower heads in mid-June, dark shiny leaves, slow growing
(D) 7-8	30'	semi-climbing	med.	- - -	white	tolerant	sun or light shade	Common White Jasmine Jasminum officinale	very fragrant flowers, semi-evergreen
(D) 4-8	20'	twining vine	med.	- - -	yellowish red to purplish red	tolerant	sun	Henry Honeysuckle Lonicera henryi	half evergreen
(E) 3-8	50'	twining vine	- - -	- - -	orange to scarlet	- - -	- - -	Trumpet Honeysuckle Lonicera sempervirens	evergreen, not rampant
(D) 4-8	15'	clinging vine	small	scarlet	- - -	tolerant	sun	Low's Japanese Creeper Parthenocissus tricuspidata 'lowi'	apple green leaves similar to 'veitchi'
(D) 4-8	15'	clinging vine	small	scarlet	- - -	tolerant	sun	Veitch Japanese Creeper Parthenocissus tricuspidata 'veitchi'	leaves purple when young, excellent for "tracery" effect on walls

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Deciduous and Evergreen Vines

Hardiness Zones	Height	Type	Leaf Size	Fall Leaf Color	Flower Color	Soil	Exposure	Name	Comments
(D) 8	30'	tendrils	large	- - -	white to blue	good	sun	Passion Flower *Passiflora caerulea*	very popular, semi-evergreen
(D) 4-8	90'	twining vine	med.	yellow	violet, white, pink	tolerant	sun	Japanese Wisteria *Wisteria floribunda*	pea-like flowers in pendulous racemes 12-36" long, in late May, needs frequent pruning
(D) 5	90'	twining vine	- - -	- - -	blue-violet	- - -	- - -	Chinese Wisteria *Wisteria sinensis*	flowers in 12" racemes mid-May, needs frequent pruning

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Deciduous and Evergreen Ground Covers

Hardiness Zones	Height	Leaf Size	Soil	Exposure	Name	Comments
(D) 3-8	8"	med.	any	sun or shade	Goutweed Aegopodium podograria 'variegatum'	cream and green foliage; useful in difficult situations; but invasive
(D) 4-8	8"	med.	any	sun or shade	Carpet Bugle Ajuga reptans	green, bronze, red, and variegated leaf forms available, blue flowers, useful in difficult situations, but invasive
(D) 4-8	8"	fine	good	light to heavy shade	Sweet Woodruff Asperula odorata	spreads rapidly, white flowers, tolerates very dense shade
(E) 4-8	4-24"	fine	acid, moist, low fertility	light shade	Scotch Heather Calluna vulgaris	head back in late winter to hold compact form, colors: white through red, flowers during fall, winter and early spring
(D) 2-8	8"	large	any	light shade to sun	Lily-of-the-Valley Convallaria majalis	spreads rapidly in good soil, white flowers in May, poor foliage color in autumn
(D) 4-8	1½-3'	med.	good	sun	Rock Cotoneaster Cotoneaster horizontalis	mounded form, evergreen in south, red fruit into winter
(E) 5-8	8"	large	good	partial shade	English Ivy Hedera helix 'Baltic'	rapid growing evergreen - also a vine, 'baltica' more cold tolerant than other selections
(E) 4-8	12"	needle-like	any	sun	Sargent Chinese Juniper Juniperus chinensis 'sargenti'	dense mat forming, steel blue color, seaside plant
(E) 2-8	12-18"	needle-like	any	sun	Creeping Juniper Juniperus horizontalis	Waukegan Juniper (J. h. 'douglasi') dense, trouble free, steel blue color Andora Juniper (J. h. 'plumosa') dense, trouble free, feathery blue-green in summer purplish in winter

SELECTED LANDSCAPE PLANTS, ZONES 2-8

Deciduous and Evergreen Ground Covers

Hardiness Zones	Height	Leaf Size	Soil	Exposure	Name	Comments
(D) 4-8	24"	med.	any	sun	Henry Honeysuckle *Lonicera henryi*	half evergreen climbing vine with yellowish red to purplish flowers, excellent on banks clear of shrubs and trees which it will climb
(E) 5-8	12"	needle-like	acid	sun or shade	Canby Pachistema *Pachistema canbyi*	dense growth, flat 1" needle leaves, requires acid soil, good drainage
(E) 4-8	6"	large	any	shade	Japanese Spurge *Pachysandra terminalis*	dense, trouble free, popular, it grows best in light to heavy shade, the color becomes an attractive yellowish-green in full sun
(E) 7-8	18"	med.	tolerant	sun	Chilean Pernettya *Pernettya mucronata*	popular in mid-south, becomes straggly in shade, white, pink, red, violet, ½" persistent fruit of particular interest
(D) 5-8	12"	med.	tolerant	sun	Memorial Rose *Rosa wichuriana*	semi-evergreen, vigorous, effective white flowers, especially good for erosion control on banks
(D) 2-8	8"	med.	acid	sun	Smoothleaf Lowbush Blueberry *Vaccinium augustifolium* 'laevifolium'	especially good for acid, rocky, low-fertility soils
(E) 4-8	6"	med.	any	sun or shade	Myrtle, Periwinkle *Vinca minor*	persistent, trouble free, attractive blue, white, or purple flowers, often used for erosion control on banks, very popular

SELECTED LANDSCAPE PLANTS

Garden Flowers, Herbaceous Perennials

Height	Months in Bloom	Flower Color	Soil	Exposure	Spacing	Name	Comments
med.	September	pink	medium	filtered sun, no wind	12"	Grapeleaf Anemone *Anemone vitifolia*	good companion for lilies, self-sows, but not rampant
med.	July	orange	well-drained	sun	18"	Butterfly Weed *Asclepias tuberosa*	permanent, difficult to transplant
med.	June	white, pink, red	wet	filtered sun	18"	Astilbe *Astilbe hybrids*	plume-shaped flower spikes, sensitive to drying, tolerant of wet soil
med.	June to July	white	medium	sun	18"	Shasta Daisy *Chrysanthemum maximum*	must be reset every 2 years or dies out
med.	August to October	many, but no blue	medium	sun	18"	Florists Chrysanthemum *Chrysanthemum morifolium*	tall kinds require staking, pinch to July 1 for compact habit, reset every year
tall	July to September	white, blue, violet	well-drained	sun, no wind	18"	Delphinium *Delphinium hybrid* esp. *D. belladonna h.*	usually requires staking
tall	May	rose	medium	filtered sun	24"	Common Bleedingheart *Dicentra spectabilis*	permanent, resents disturbance, foliage gone after July
med	June	pink, white	medium	sun	24"	Gas Plant Dittany *Dictamnus fraxinella*	permanent, resents disturbance, blooms give off ignitable gas
tall	June to October	blue	medium	sun	24"	Small Globethistle *Echinops ritro* esp. '*Taplow Blue*'	spherical blooms, reset every 2-3 years

SELECTED LANDSCAPE PLANTS

Garden Flowers, Herbaceous Perennials

Height	Months in Bloom	Flower Color	Soil	Exposure	Spacing	Name	Comments
tall or med.	May to October	yellow, orange, pink, mahogany	tolerant	sun	24"	Daylily *Hemerocallis hybrids*	hundreds of named cultivars, flowering period varies with cultivar and age, some are night-flowering, reset every 3-4 years
med.	June to October	red	medium	sun or filtered sun	12"	Coral Bells *Heuchera sanguinea*	foliage only 6" high, good cut flower, reset every 2-3 years
tall	August to September	white, rose, red	wet	sun	36"	Rosemallow *Hibiscus moscheutos*	late and slow spring growth, large blooms, tolerates very wet soil
short	May	white	medium	sun	12"	Evergreen Candytuft *Iberis sempervirens*	permanent, old plants may require reshaping
med.	July	orange	well-drained	sun	18"	Sword Torchlily *Kniphofia foliosa*	permanent
short	June to August	lavender	medium	sun	12"	True Lavender *Lavendula vera* esp. '*Munstead*'	permanent, may be sheared for dwarf
tall	August to September	red	wet	filtered sun	18"	Cardinal Flower *Lobelia cardinalis*	permanent, brilliant flowers, thrives in wet soil
tall	July to September	pink	wet	sun	18"	Loose Strife *Lythrum superbum*	named cultivars are better than species, may be grown in shallow water

SELECTED LANDSCAPE PLANTS

Garden Flowers, Herbaceous Perennials

Height	Months in Bloom	Flower Color	Soil	Exposure	Spacing	Name	Comments
med.	June	white, pink, red	medium	sun	36"	Peony *Paeonia hybrids*	resents disturbance, brown foliage in fall should be removed and burned to prevent bud blight
med.	June to July	white, orange, red	tolerant	sun	24"	Oriental Poppy *Papaver orientale*	permanent, very large blooms, foliage dies after July, can be reset *only* in August
med.	July to August	white, pink	medium	sun	12"	Summer Phlox *Phlox paniculata*	remove old flower heads of inferior seedlings will replace cultivar, reset every 2 years
med.	June	yellow, gold	medium	sun	18"	Globeflower *Trollius europaeus*	permanent, blooms resemble giant buttercup

SELECTED LANDSCAPE PLANTS

Garden Flowers, Herbaceous Annuals

Height	Months in Bloom	Flower Color	Soil	Exposure	Spacing	Name	Comments
tall, med., or short	July to October	all except blue	medium	sun	9-12"	Common Snapdragon *Antirrhinum majus*	height depends on cultivar, good cut flower
med.	July to October	foliage, all except blue and lavender	medium	filtered sun	9"	Common Coleus *Coleus blumei*	grown for interesting foliage colors
short	July to October	all except blue	medium	filtered sun or sun	9"	Sultan Snapweed *Impatiens sultani*	outstanding for shade, will flower well as a house plant
med.	June to October	white, pink, red	medium	sun	9"	Fish Pelargonium *Pelargonium hortorum*	very popular
short	June to October	all colors	tolerant	filtered sun or sun	9"	Petunia *Petunia hybrid*	most popular annual; cut to 6" and fertilize in August for good fall flowering
tall, med., or short	June to October	red	tolerant	filtered sun or sun	12-24"	Scarlet Sage *Salvia splendens*	height depends on cultivar, brilliant color
tall, med., or short	July to October	yellow, orange, and mahogany	tolerant	sun	9-12"	Aztec Marigold *Tagetes erecta*	height depends on cultivar, very popular

SELECTED LANDSCAPE PLANTS

Garden Flowers, Bulbs

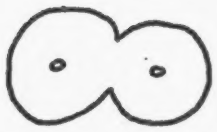
Height	Months in Bloom	Flower Color	Soil	Exposure	Spacing	Planting Depth	Name	Comments
short	September	lavender	tolerant	sun	12"	6"	"Autumn Crocus" *Colchicum autumnale*	permanent not a true crocus
short	April	white, blue, lavender and yellow	well-drained	sun, filtered sun	4"	4"	Crocus *Crocus species*	foliage must ripen for flowers after first year, corms eaten by rodents
tall	July	white	well-drained	sun	18"	6"	Madonna Lily *Lilium candidum*	very fragrant, spray with captan in spring to prevent Botrytis
tall	September	pink	well-drained	sun	12"	9"	Rubrum Lily *Lilium speciosum 'rubrum'*	requires staking
short	May	blue	tolerant	sun, filtered sun	4"	4"	Armenian Grape Hyacinth *Muscari armeniacum*	permanent, foliage remains all year
med.	April to May	yellow, white	tolerant	filtered	6"	6-9"	Daffodil *Narcissus pseudonarcisus*	foliage must ripen for good flowering next season, may be used in woodlands
short	April to May	blue	tolerant	sun, filtered sun	4"	4"	Siberian Squill *Scilla siberica*	cultivar "Spring Beauty" is best, permanent, may be planted close to deciduous shrubs
med.	May	all	well-drained	filtered sun	6"	6-9"	Tulip *Tulipa hybrid*	foliage must ripen for good flowering next season, lift only once in 3 years, permanence depends on cultivar

The Pennsylvania State University
College of Agriculture
Department of Agricultural Education
University Park, Pennsylvania

LANDSCAPE MAINTENANCE AND ESTABLISHMENT EXAMINATION

DIRECTIONS: Do not write on this test booklet. Use the separate answer sheet. Blacken out the letter of the most appropriate answer for each question.

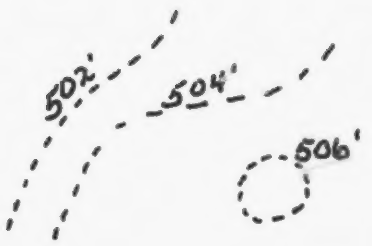
1.



This blueprint symbol indicates:

a. two pools
b. two parking areas
c. two trees of the same variety
d. a hedge

2.



This blueprint symbol indicates:

a. that a tree is to be planted 506' from a road
b. the location of level lines of equal height
c. the location of a knob 506' in circumference
d. the location of sewer lines

3. Which of the following statements concerning weed control is true?
   a. ground covers make weed control more difficult
   b. the safest means of controlling weeds is the chemical spray
   c. lawn herbicides should not be applied to newly established lawns
   d. lawn herbicides should be applied in mid-July

4. The two most practical means of the home owner to control insects and diseases are:
   a. mechanical and chemical
   b. mechanical and biological
   c. chemical and biological
   d. biological and natural

5. Which of the following statements is true?
   a. non-hardy bulbs are planted in October
   b. hardy bulbs should be lifted each year in October
   c. certain annuals will flower best in early fall if cut back leaving 4 - 6 inch stems in mid-July
   d. most herbaceous plants should be sprayed each week while in flower

6. Which of the following statements is true?
   a. lawns should always be mowed in the same direction
   b. goldfish are placed in pools to prevent the accumulation of algae
   c. pools are best wintered without water in them
   d. sudden changes in water temperature are fatal to fish

7. A plant which is hardy in Zone V is also hardy in Zone:
   a. II
   b. III
   c. IV
   d. VI

8. Drainage tile lines are usually placed:
   a. 4 - 6 feet deep
   b. with a 1/8 inch per foot slope
   c. 2 - 3 feet apart
   d. in sloping sandy soils

9. Which of the following statements concerning heavy clay soils is true?
   a. they have good nutrient and water holding capacity
   b. they are coarse in texture
   c. they are resistant to compaction
   d. they seldom need drainage

10. Which of the following statements concerning sandy soils is true?
   a. they seldom require fertilization
   b. they require frequent fertilization
   c. they have excellent water holding capacity
   d. they are highly susceptable to compaction

11. English Ivy (Hedra helis 'baltica') is:
   a. an evergreen ground cover plant
   b. a small evergreen shrub
   c. a small deciduous shrub
   d. a deciduous ground cover plant

12. Wares Arborvitae (Thuja occidentalis 'wareana') grows in the northeast as:
   a. an evergreen ground cover plant
   b. a large evergreen shrub
   c. a small evergreen tree
   d. a large deciduous tree

13. When fertilizing broadleaf evergreens:
   a. apply a generous amount
   b. apply only in the fall
   c. never use an inorganic fertilizer
   d. apply only in the spring

14. Which of the following people designs, establishes, and maintains small scale landscape projects?
    a. the grounds superintendent
    b. the landscape nurseryman
    c. the garden center manager
    d. the landscape worker

15. Which of the following people works under the supervision of a foreman in establishing and maintaining landscapes?
    a. the garden center salesman
    b. the garden center worker
    c. the landscape worker
    d. the nursery salesman

16. Forsythia is noted for:
    a. its bright red berries in the fall
    b. its needle-like foliage
    c. its golden yellow flowers in spring
    d. its tree-like growth

17. Which of the following is a large deciduous tree?
    a. Norway Spruce (*Picea abies*)
    b. Red Maple (*Acer rubrum*)
    c. Japanese Maple (*Acer palmatum*)
    d. Canadian Hemlock (*Tsuga canadensis*)

18. Which of the following is a narrowleaf evergreen shrub?
    a. Spreading Japanese Yew (*Taxus cuspidata*)
    b. Sweet Bay Laurel (*Laurus mobilis*)
    c. Flame Azalea (*Rhododendron calendulaceum*)
    d. Boxleaf Holly (*Ilex crenata 'convexa'*)

19. Which of the following is an evergreen ground cover?
    a. Boxleaf Holly (*Ilex crenata 'convexa'*)
    b. Nandina (*Nandina domesticum*)
    c. Glossy Abelia (*Abelia grandiflora*)
    d. Myrtle, Periwinkle (*Vinca minor*)

20. Which of the following is a small deciduous shrub?
    a. Wintercreeper (Euonymus fortunei 'vegetus')
    b. Leatherleaf Viburnum (Viburnum rhytidophyllum)
    c. Laland Firethorn (Pyracantha coccinea 'lalandi')
    d. Rock Cotoneaster (Cotoneaster horizontalis)

21. Which of the following is a small deciduous tree?
    a. White Fir (Abies concolor)
    b. Koster Blue Spruce (Picea pungens 'kosteriana')
    c. Flowering Dogwood (Cornus florida)
    d. Pyramidal English Oak (Quercus robur 'fastigiata')

22. Which of the following is a large evergreen tree?
    a. Cedar of Lebanon (Cedrus libonica)
    b. Little-leaf Linden (Tillia cordata)
    c. Washington Hawthorn (Crataegus phaenopyrum)
    d. Sweetgum (Liquidambar styraciflua)

23. Which of the following is an evergreen vine?
    a. Tea Viburnum (Viburnum setigerum)
    b. Japanese Wisteria (Wisteria floribunda)
    c. Creeping Juniper (Juniperus horizontalis)
    d. Trumpet Honeysuckle (Lonicera sempervirens)

24. Which of the following is a perennial herbaceous plant?
    a. Petunia (Petunia hybrid)
    b. Coleus (Coleus blumei)
    c. Shasta Daisy (Chrysanthemum maximum)
    d. Marigold (Tagetes erecta)

25. Which of the following herbaceous plants is grown from bulbs and flowers in the spring?
    a. Petunia (Petunia hybrid)
    b. Coleus (Coleus blumei)
    c. Delphinium (Delphinium hybrid)
    d. Daffodil (Narcissus pseudonarcissus)

26. Which of the following is a large evergreen shrub?
    a. Japanese Barberry (Berberis thunbergi)
    b. Yoshimo Cherry (Prunus yedoensis)
    c. Common Camellia (Camellia japonica)
    d. Upright Japanese Yew (Taxus cuspidata 'capitata')

27. The maximum recommended height for dry walls is:
    a. 3½' to 4'
    b. 4½' to 5'
    c. 5½' to 6'
    d. 6½' to 7'

28. During dry periods, landscape plants should be:
    a. watered lightly every day
    b. watered heavily once each 7-10 days
    c. watered and fertilized heavily each week
    d. watered only after darkness

29. Which of the following statements is true?
    a. systemic insecticides are very dangerous to humans
    b. dusts are popular insecticides because they can be applied at any time
    c. sprays should be applied as a very fine mist as this reduces drift
    d. systemic insecticides come only in the granular form

30. When constructing a dry wall, the slope of the wall should be:
    a. ½" per foot of height
    b. 1" per foot of height
    c. 1½" per foot of height
    d. 2" per foot of height

31. When constructing a patio, ideally, the foundation should be made with a compacted sub-grade and:
    a. a coarse aggregate and sand
    b. coarse aggregate alone
    c. sand alone
    d. coarse concrete and sand

32. Both asphalt and concrete are used for hard surfacing driveways. Which of the following is true for asphalt?
    a. the thickness of an asphalt needed for a driveway is less than the thickness of concrete needed for a driveway
    b. asphalt should be pitched to promote drainage
    c. asphalt does not need a porous base material
    d. asphalt is crowned to promote drainage

33. The proper pH range for growing most nursery stock is:

   a. 5.0 to 5.5
   b. 5.5 to 6.5
   c. 6.0 to 6.5
   d. 6.5 to 7.0

34. The proper pH range for growing acid-loving plants like azaleas and rhododendron is:

   a. 3.0 to 4.0
   b. 5.0 to 6.0
   c. 4.0 to 5.0
   d. 6.0 to 7.0

35. When transplanting nursery stock to a landscape, the practice of balling and burlapping evergreens and certain deciduous plants:

   a. reduces the need for water
   b. requires deeper planting
   c. reduces labor
   d. reduces plant losses

36. Heavy soils of clay and light soils of sand often are modified before transplanting nursery stock. The soil modification enables:

   a. light soils to absorb water more rapidly
   b. heavy soils to hold more nutrients
   c. heavy soils to provide better aeration
   d. light soils to be less restrictive in root growth

37. When transplanting deciduous trees, about one-third of the growth should be removed. This pruning is done primarily to:

   a. develop a desirable shape
   b. compensate for roots lost
   c. reduce the transpiration from the leaves
   d. make the tree easier to handle

38. The purpose of guying or staking a recently transplanted tree is to:

   a. protect the trunk
   b. prevent root damage due to wind action
   c. prevent wind injury to branches
   d. prevent heaving due to frost action

39. Forsythia flowers on wood produced the previous season. This type of nursery stock:

   a. should be pruned after flowering
   b. does not need to be pruned
   c. should be pruned in the dormant stage
   d. should be cut back heavily in late summer

40. Which of the following plants requires very little pruning?

   a. yew
   b. rhododendron
   c. privet
   d. spirea

41. Pruning is a recommended practice for some narrow-leaved evergreens to keep them within bounds. It should be done during:

   a. early fall
   b. the winter
   c. the summer
   d. early spring

42. Certain trees with thin bark need to be protected during the period of establishment. Several materials are used for protection. Which material is recommended?

   a. asphalt emulsion
   b. white wash
   c. tanglefoot
   d. heavy crepe paper

43. Pruning should not be done near the end of the summer because:

   a. new growth will not harden before winter
   b. it may increase foliage disease
   c. plants will not recover in time to produce new growth before winter
   d. severe "bleeding" from the cuts will kill the plant

44. Broad-leaved evergreens require little pruning. Which plant is not a broad-leaved evergreen?

   a. rhododendron
   b. Pfitzer juniper
   c. mountain laurel
   d. Japanese andromeda

45. Which fertilizer ratios are recommended for most trees and shrubs?
  a. 1-2-2 and 2-3-2
  b. 1-1-1 and 2-3-2
  c. 2-2-2 and 1-2-1
  d. 2-1-1 and 1-2-1

46. The rate of fertilizer application for trees is based on the:
  a. diameter of the tree trunk four feet above the soil line
  b. diameter of the tree trunk at the base of the tree
  c. height of the tree
  d. spread of the tree

47. Broad-leaved evergreens such as hollies and rhododendron should be fertilized in:
  a. early spring
  b. late fall
  c. late summer
  d. early summer

48. Hedges are sheared to produce and maintain a dense, compact growth. Frequency of shearing varies with:
  a. the size of the hedge
  b. the kind of plant material
  c. the temperature
  d. the sunlight exposure

49. The punch bar method of fertilizing trees distributes the fertilizer:
  a. in holes around the drip line
  b. as a surface drench
  c. as a broadcast method
  d. as the drip line and inside the drip line of the tree

50. Good safety practices in the use of herbicides and insecticides include:
  a. application of windy weather to assure good distribution
  b. avoid spilling materials on the skin, and wash thoroughly if spilling occurs
  c. identify the material by taste
  d. read only that part of the label concerned with application rates

NAME ______________________________ DATE ____________________

Answer sheet for examination on Landscape Maintenance and Establishment.

DIRECTIONS: Blacken out the letter of the best answer for each question.

1.	a	b	[✓ c]	d	26.	a	b	c	[✓ d]
2.	a	[✓ b]	c	d	27.	a	[✓ b]	c	d
3.	a	b	[✓ c]	d	28.	a	[✓ b]	c	d
4.	[✓ a]	b	c	d	29.	[✓ a]	b	c	d
5.	a	b	[✓ c]	d	30.	a	b	c	[✓ d]
6.	a	b	c	[✓ d]	31.	a	b	c	[✓ d]
7.	a	b	c	[✓ d]	32.	a	b	c	[✓ d]
8.	a	[✓ b]	c	d	33.	a	b	c	[✓ d]
9.	[✓ a]	b	c	d	34.	a	[✓ b]	c	d
10.	a	[✓ b]	c	d	35.	a	b	c	[✓ d]
11.	[✓ a]	b	c	d	36.	a	b	[✓ c]	d
12.	a	[✓ b]	c	d	37.	a	b	[✓ c]	d
13.	a	b	c	[✓ d]	38.	a	[✓ b]	c	d
14.	a	[✓ b]	c	d	39.	[✓ a]	b	c	d
15.	a	b	[✓ c]	d	40.	a	[✓ b]	c	d
16.	a	b	[✓ c]	d	41.	a	b	c	[✓ d]
17.	a	[✓ b]	c	d	42.	a	b	c	[✓ d]
18.	[✓ a]	b	c	d	43.	[✓ a]	b	c	d
19.	a	b	c	[✓ d]	44.	a	[✓ b]	c	d
20.	a	b	c	[✓ d]	45.	a	b	c	[✓ d]
21.	a	b	[✓ c]	d	46.	[✓ a]	b	c	d
22.	[✓ a]	b	c	d	47.	[✓ a]	b	c	d
23.	a	b	c	[✓ d]	48.	a	[✓ b]	c	d
24.	a	b	[✓ c]	d	49.	a	b	c	[✓ d]
25.	a	b	c	[✓ d]	50.	a	[✓ b]	c	d